SYSTEMATIC BOTANY AND MYCOLOGY LABORATORY

Plant Sciences Institute
USDA, ARS

In-Depth Program Review

May 7-8, 1997

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AGENDA

Systematic Botany and Mycology Laboratory

Plant Sciences Institute

In-Depth Review
May 7-8, 1997
Conference Room, Rm. 119
Bldg. 011A, BARC-West
Beltsville, MD

Wednesday, May 7
8:15 - Coffee
8:30 - Introductions - Barbara Leonhardt
8:40 - Laboratory Overview - Amy Y. Rossman
9:00-9:45 - Executive Session - Charge to the Committee
9:45-10:00 - Break

Closed Sessions with Scientists-Systematics of Vascular Plants
10:00-11:00 - Joseph H. Kirkbride, Jr. - *Lotus*, Faboid Seed and Fruit Morphology
11:00-Noon - John H. Wiersema - Nomenclature of Vascular Plants for National Plant Germplasm System
Noon-1 PM - Lunch (in-house) and Tour of Laboratory Facilities

Closed Sessions with Scientists-Systematics of Fungi
1:00-2:00 - David F. Farr - Systematics of Plant Pathogenic Fungi - *Septoria*, and other Coelomycetes, On-line information systems about fungi
2:00-3:00 - Amy Y. Rossman - U.S. National Fungus Collections, Fungal Biodiversity, Genera of the Hypocreales
3:00-3:30 - Break
3:30-4:30 - Gary J. Samuels - Systematics of *Hypocrea-Trichoderma*
4:30-5:30 - B. Sue Mischke - Characterization of Biocontrol Fungi

Thursday, May 8
8:30-9:30 - Group Interview with Postdoctoral Fellows, Karol Elias and Lisa Castlebury, and Associated Scientists, Mary Palm and Larissa Vassilieva
9:30-10:30 - Group Interview with Support Personnel
10:30-11:30 - Committee Deliberations and Ad Hoc Interviews
11:30-1:00 - Working Lunch for Review Team to Draft Preliminary Report
1:00-3:00 - Executive Session, **Bldg. 003, Rm. 230**
3:00-3:30 - Report of Review Committee to Scientists

Review Team

Elwin Stewart, Head
Department of Plant Pathology
Pennsylvania State University
University Park, PA

Rebecca Bech, Chief Operations Officer
Biological Assessment & Technical Support
USDA-APHIS
Riverdale, MD

Peter K. Bretting, Research
Leader/Coordinator
Regional Plant Introduction Station
USDA-ARS
Ames, IA

Administrators

K. Darwin Murrell, Director
Beltsville Area

Barbara A. Leonhardt, Institute Director
Plant Sciences Institute

Phyllis E. Johnson, Associate Director
Beltsville Area

Ronald F. Korcak, Associate Director
Plant Sciences Institute

Darrell F. Cole, Assistant Director
Beltsville Area

National Program Staff

Henry L. Shands
Acting Administrator for Genetic Resources and Biodiversity

Roy Gingery
National Program Leader
Plant Health

Judith B. St. John
ADA, Crop Production, Product Value and Safety

Roger Lawson
National Program Leader
Horticulture and Sugar

Raymond Carruthers
National Program Leader
Biological Control

John Radin
National Program Leader
Plant Physiology and Cotton Products

James Elgin
National Program Leader
Forage Crops

MISSION STATEMENTS

SYSTEMATIC BOTANY AND MYCOLOGY LABORATORY

The mission of the Systematic Botany and Mycology Laboratory is to increase the knowledge and application of the systematics of fungi and vascular plants essential to developing new technologies and solving problems in sustainable, rural farm, and conventional agriculture. Research emphasis is on organisms important as genetic resources, as biological control agents to reduce the need for chemical inputs in low-input sustainable agriculture, and as pathogens that threaten the production of a safe and abundant food supply. Research outputs are primarily comprehensive monographic studies that combine morphological, biochemical, and molecular techniques. On-line information is provided to worldwide users through publication in electronic format and Internet access to electronic databases. The U.S. National Seed Herbarium, the U.S. National Fungus Collections, and the John A. Stevenson Reference Library serve as unique reference resources preserved and developed for use throughout the world.

PLANT SCIENCES INSTITUTE

The Plant Sciences Institute research mission is to develop biological, chemical, and physical processes and principles including bioregulation that will improve pest management systems, improve crop quality and production efficiency, improve conservation of natural resources, improve environmental quality, support regulatory and action agencies, respond to research needs identified by farmers and other "customers", and contribute to advances in biotechnology and other societal benefits. The Institute's mission is accomplished through complex and exceptionally difficult fundamental and applied research programs in 14 laboratories.

AGRICULTURAL RESEARCH SERVICE

Provide access to agricultural information and develop new knowledge and technology needed to solve technical agricultural problems of broad scope and high national priority to ensure adequate availability of high-quality, safe food and other agricultural products to meet the nutritional needs of the American consumer, to sustain a viable and competitive food and agricultural economy, to enhance quality of life and economic opportunity for rural citizens and society as a whole, and to maintain a quality environment and natural resource base.

RESEARCH, EDUCATION AND ECONOMICS

The Research, Education and Economics (REE) area of USDA is dedicated to the creation of a safe, sustainable, competitive U.S. food and fiber system and strong, healthy communities, families and youth through integrated research, analysis and education.

INTRODUCTION

The Systematic Botany and Mycology Laboratory is the center of research and service for the systematics of agriculturally important vascular plants and fungi in the United States. The research program and associated reference resources are unique in tackling the systematics of vascular plants and fungi that solve problems in U.S. agriculture. The U.S. National Seed Herbarium and the U.S. National Fungus Collections are maintained and developed as research resources for use by the national and international research community.

The Systematic Botany and Mycology Laboratory resulted from combining portions of the Mycology Laboratory (1954-1985) and the Plant Exploration and Taxonomy Laboratory (1967-1985). Prior to the formation of the SBML, the Mycology Laboratory included six, full-time research scientists most of whom were working in the area of the systematic mycology; the PETL consisted of eight scientists who conducted plant exploration as well as research in plant taxonomy. In December 1985 the Systematic Botany, Mycology and Nematology Laboratory was created to include those scientists conducting systematics research with vascular plants, fungi and nematodes. The two research systematic nematologists were transferred back to the Nematology Laboratory in 1988.

At the time this new Laboratory was created, the vascular plant group consisted of four scientists: Dr. R. Charles Gunn, then Director, U.S. National Seed Herbarium, now retired; Dr. Joseph Kirkbride; Dr. Ed Terrell, grass systematist who was replaced by Dr. Robert Webster, now relocated; and Dr. John Wiersema, who, with two associated University of Maryland scientists, worked on the nomenclature of vascular plants. Dr. Robert Perdue was transferred to SBMNL one year later and has since retired. Initially, this new Laboratory emphasizing systematics was to include two plant systematists from the National Arboretum and a portion of the Herbarium at the National Arboretum was to be moved to Beltsville. However, this part of the plan was never implemented.

For many years the Mycology Laboratory consisted of six research scientists and the associated Animal and Plant Health Inspection Service (APHIS) mycologist. However, in 1984, one research mycologist was transferred to the now Molecular Plant Pathology Laboratory and a second mycologist who retired in 1985 was not replaced. At the time the SBMNL was created the mycology group included four research scientists: Dr. David Farr, Dr. Marie L. Farr (retired in 1988 and replaced by Dr. Gary Samuels), Dr. Amy Y. Rossman, and Dr. Francis A. Uecker (retired in 1995). Dr. B. Sue Mischke was transferred into the SBML in 1995.

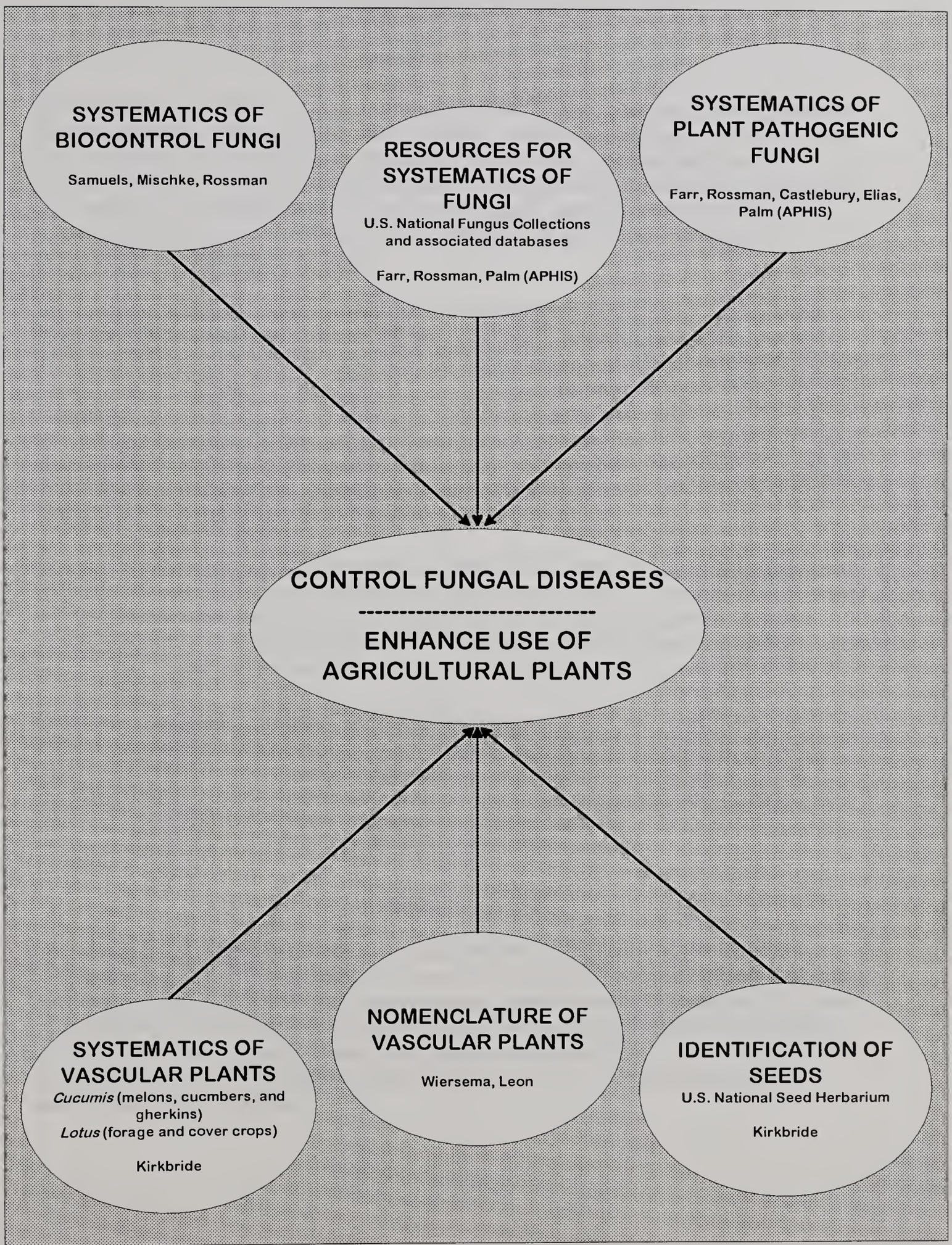
At present, the Systematic Botany and Mycology Laboratory (SBML) consists of six full-time scientists whose approach to solving agricultural problems is primarily through systematic studies of vascular plants and fungi. Drs. Joseph Kirkbride and John Wiersema contribute to the systematics of vascular plants in support of the National Plant Germplasm System and direct the activities of the U.S. National Seed Herbarium. Four research scientists conduct programs on the systematics of agriculturally important fungi including the activities of the U.S. National Fungus

Collections and the John A. Stevenson Reference Room, partially owned by the Smithsonian Institution.

Since the brief Laboratory Review on April 6, 1995, Dr. Robert Webster has moved to another ARS location; he had worked on the systematics of grasses, particularly of sugarcane and its relatives. This research project was terminated on September 30, 1995. Mr. Richard Spjut, the support scientist working with Dr. Joseph Kirkbride, has retired. The manager of the U. S. National Fungus Collections, Ms. Loretta Alessandrini, 0.5 FTE, will be retiring in June, 1997, and will be replaced. Additional personnel include two research associates, ten additional full-time or part-time support personnel, the APHIS mycologist, and a visiting research scholar.

SYSTEMATIC BOTANY AND MYCOLOGY LABORATORY

PROGRAMS



ACCOMPLISHMENTS (1995-1997)

Systematics of Vascular Plants

Scientific names of vascular plants in commercial seed trade. Seeds are the most common form of commercial exchange of agricultural crops. A standard nomenclature dealing with seed crops is essential to this industry. In cooperation with the society of seed trade analysts, a reference list was produced of all scientific names of vascular plants important to the commercial seed industry. This reference is used by seed trade analysts, plant quarantine officials, and commodity groups to expedite the national and international commercial exchange of agriculturally important crops as seeds.

On-line information on the nomenclature of economic vascular plants. Communication about economic vascular plants depends directly on accurate scientific names. The search for germplasm using the Germplasm Resources Information Network (GRIN) is initiated through the scientific name. Taxonomic data in GRIN include the scientific names of about 50,000 species of vascular plants as well as common names, distribution records, and economic uses. These data are used by personnel in the National Plant Germplasm System and the public worldwide. Those routinely accessing the GRIN taxonomic data for information on the nomenclature of economic plants include: USDA-APHIS, USDA-NRCS (formerly SCS), USDA-AMS, Association of Official Seed Analysts and the Plant Genome Project.

Manual for identification of legumes seeds. Seeds in the legume tribe that includes peas and beans are commercially important as food crops and noxious weeds. A comprehensive reference for their identification is needed. Such a manual has been developed that includes a key to identify seeds of the 450 faboid genera as well as descriptions and illustrations. This book will be used by plant regulatory and seed trade officials as well as scientists throughout the world.

Systematics knowledge promotes use of trefoil, the genus *Lotus*, as forage plant. Birdsfoot trefoil, *Lotus corniculatus*, is the fourth most commonly utilized forage legume in the United States after alfalfa, red clover and white clover. It is susceptible to root and crown rotting organisms, and the common cultivars are annuals. The five most agriculturally important taxa of *Lotus* were described as well as a key for their identification published. A worldwide checklist was developed for all *Lotus* species with their geographic distributions.

Systematics of fungi

New melon-killer fungus described to combat disease. In the spring of 1995, cantaloupes, honeydew and watermelons growing in the lower Rio Grande Valley region of Texas were almost completely destroyed by a disease of unknown origin. Several potentially pathogenic fungi were isolated from the melon roots and determined to be a species not previously known to science. Dr. David Farr described and illustrated this fungus as a new genus and species. As a result, it is now possible to identify the fungus that is destroying melons in this region and to develop a control strategy for the disease.

On-line information about plant-associated fungi. Information about fungi is critical to solving the problems caused by fungi. Using the Internet, those outside the Systematic Botany and Mycology Laboratory can access in-house databases about plant-associated fungi. The information available to users includes: 1) the database of plant-associated fungi in the United States as well as outside the U.S.; 2) the database of 14,000 references on the systematics of plant-associated fungi; 3) data on 700,000 of the one-million specimens in the U.S. National Fungus Collections; 4) 117,000 fungal names in Saccardo's, Sylloge Fungorum, and several smaller databases. Over the past ten months the system was accessed almost 100,000 times by about 8,000 customers ranging from APHIS and extension personnel to international scientists (see p. 13-15 for Home Page Statistics and Specimens Loaned from the U.S. National Fungus Collections 1995-97).

Database of plant-associated fungi for high-priority risk assessments. Fungi that occur on agricultural and horticultural crops outside the United States are a threat to U.S. agriculture. Knowledge of their geographic distribution and host range is necessary to make informed plant quarantine decisions. A database of fungi that occur outside the United States now includes about 200,000 records as well as about 6,000 scientific names of fungi on high priority hosts and 4,000 fungi of plant quarantine significance. All data are available on-line to outside users. These data are essential to plant regulatory officials in making risk assessments concerning the allowable importation of nursery stock, logs, and other plant material.

Systematics of the biocontrol and plant pathogenic fungi in the Hypocreales. Fungi in the ascomycetous order Hypocreales are of great importance to humanity in areas ranging from the cause of serious plant diseases and production of toxins in food to the production of powerful antibiotics. Descriptions, illustrations and keys for identification are provided for several important genera in the Hypocreales including their asexual states. Generic and species concepts of the *Hypocrea* anamorph genera, *Gliocladium* and *Trichoderma,* have been clarified using both morphological and macromolecular approaches. These studies have demonstrated that within *Nectria* having *Fusarium* anamorphs, species known to cause diseases of plants are only distantly related to those that are useful in biological control. This research allows others to identify these fungi and thus to determine accurate disease control strategies, to locate and develop improved biocontrol organisms, to manipulate strains industrially important in the production of cellulase and other enzymes, and to make informed decisions about the export-import of agricultural commodities.

Morphological and molecular systematics of *Phomopsis*. The trees of the eastern deciduous forests are declining in vigor from an unknown cause. One group of organisms associated with these trees are fungi belonging to the genus *Phomopsis*. These fungi cause stem canker, blight and pod rot of soybeans and other diseases on crops and trees. More than 800 species of *Phomopsis* have been named based primarily on the assumption that the species were host specific. Recent research demonstrates that some species of *Phomopsis* have broad host ranges and that species of *Phomopsis* on one crop may occur on species growing nearby that may serve as a source of infection. These results are important for disease control, breeding for resistance, and implementing plant quarantine regulations.

Genetic basis of biological control by mycoparasite. Plant pathogenic fungi belonging to the ascomycete family Sclerotiniaceae cause watery soft rot, white mould, and other diseases of crops and vegetables. The beneficial fungus *Sporidesmium sclerotivorum* attacks sclerotia of this destructive group of plant pathogenic fungi and, therefore, has the potential to be extremely useful in biological control. Development of biological control agents requires an understanding of the interactions of the biocontrol agent with the target organism. Germination of conidia of the biocontrol fungus was demonstrated to occur in response to a chemical stimulant produced by sclerotia of the plant pathogen. Use of this non-chemical control could limit damage to crops by these pathogenic fungi and reduce the chemicals needed to produce and market fresh vegetables.

Sexual fungi produce more cellulase. Fungi serve as excellent sources of industrial enzymes because they grow rapidly and can be screened for strains that produce high levels of the desired enzyme. *Trichoderma reesei* produces cellulase breaking down cellulose into simple sugars so that waste products such as sugarcane bagasse and pulp paper residues can be fed to animals. This fungus reproduces itself without undergoing sex but was determined to be related to fungi that reproduce sexually. By knowing the sexually reproducing relatives, it is possible to find fungi in nature that produce high levels of cellulase for industrial purposes.

Reliable method to measure protease production. Proteases degrade proteins and are considered important regulators of fungal parasitism, yet a reliable method for measuring proteases production by fungi is lacking. Both water-soluble and water-insoluble substrates, each with an attached dye molecule, were compared for their ability to measure protease production. Azoalbumin was determined to be the best water-soluble substrate while azocoll was the best water-insoluble substrate, both reliably releasing dye in proportion to enzyme activity. This method will be used to measure protease production in order to predict what fungi can best serve as biocontrol agents of plant pathogenic fungi.

Simple test to measure microbe-microbe inhibition. An assay is needed that measures and predicts the potential of microorganisms to function as biological control agents. A rapid test was developed that quantitatively measures the ability of one microorganism to inhibit the growth of another microorganism. Its reliability was tested by measuring the antagonistic activity of strains of *Trichoderma* and correlating that with known biocontrol effectiveness. This assay will be used by scientists to discover and develop effective microorganisms as biological control agents.

How-to manual for inventorying fungal biodiversity. Fungi are increasingly recognized as important components of agricultural and forest ecosystems yet the methods required to inventory them are scattered, contradictory and difficult to obtain. A standard set of techniques for sampling and isolating fungi from all kinds of substrates and habitat has been assembled and published. A strategy was developed for sampling all species of fungi in a large, terrestrial area. These techniques will be used by those who are exploring and characterizing fungi in order to sustainably use them or to protect them from destruction.

Web Server Statistics for Systematic Botany and Mycology

Program started at Thu-17-Apr-1997 01:00 local time.
Analysed requests from Thu-20-Jun-1996 10:57 to Thu-17-Apr-1997 00:13 (300.6 days).

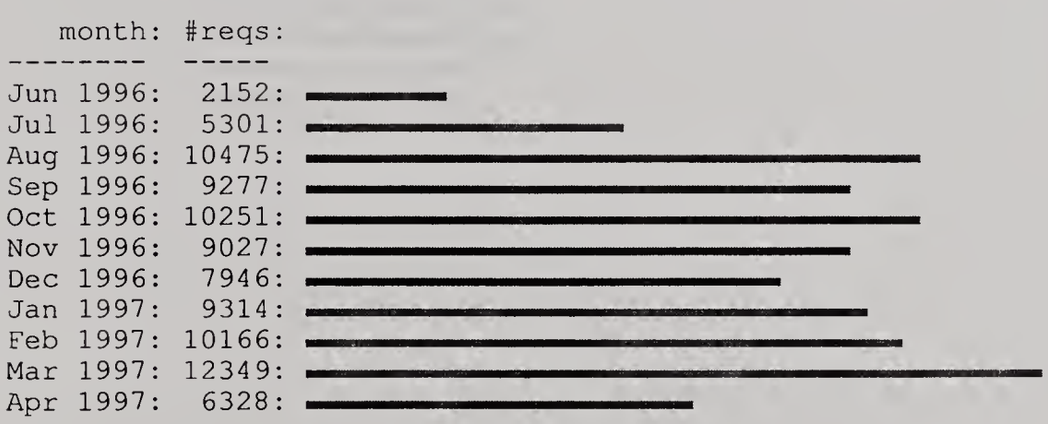
Total completed requests: 92,586 (2,729)
Average completed requests per day: 308 (389)
Total failed requests: 1,873 (94)
Total redirected requests: 1,712 (38)
Number of distinct files requested: 464 (143)
Number of distinct hosts served: 6,407 (365)
Number of new hosts served in last 7 days: 256
Corrupt logfile lines: 1,399
Total data transferred: 552,006 kbytes (13,470 kbytes)
Average data transferred per day: 1,837 kbytes (1,924 kbytes)
(Figures in parentheses refer to the last 7 days).

(**Go To**: Monthly report: Daily summary: Hourly summary: Directory report: Request report)

Monthly Report

(**Go To**: Top: Daily summary: Hourly summary: Directory report: Request report)

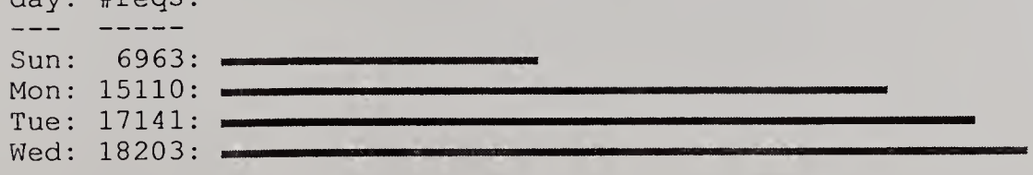
Each unit (▬) represents 300 requests, or part thereof.



Daily Summary

(**Go To**: Top: Monthly report: Hourly summary: Directory report: Request report)

Each unit (▬) represents 400 requests, or part thereof.



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Thu: 16281:
Fri: 13546:
Sat:  5342:
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Hourly Summary

(**Go To**: Top: Monthly report: Daily summary: Directory report: Request report)

Each unit (_) represents 150 requests, or part thereof.

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hr: #reqs:
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 0:  1718:
 1:  1743:
 2:  2211:
 3:  1938:
 4:  2541:
 5:  2199:
 6:  3043:
 7:  4765:
 8:  5883:
 9:  5510:
10:  6925:
11:  6289:
12:  5158:
13:  6260:
14:  6591:
15:  5931:
16:  4806:
17:  3774:
18:  2685:
19:  2474:
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21:  2779:
22:  2296:
23:  2248:
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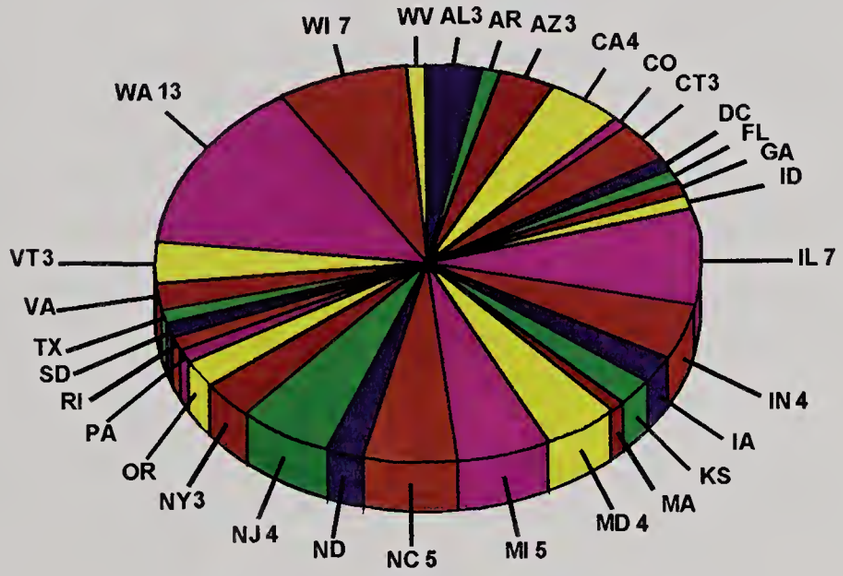
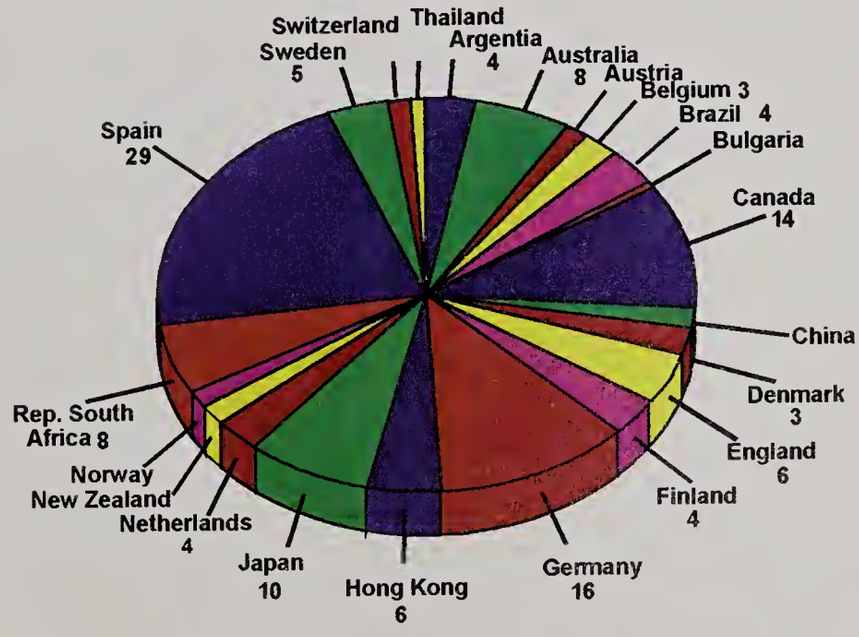
Loans from U.S. National Fungus Collections 1995-1997

227 Total Loans



91 National Loans



136 International Loans

SUMMARY OF FINANCIAL RESOURCES

CRIS PROJECTS

CRIS #	TITLE	SY(s) FTE	NET TO LOC
1275-21000-111-00D Term. date: 05/17/00	Systematics of Vascular Plants Important to Agriculture	J. Kirkbride (1.00) J. Wiersema (1.00) A. Rossman (.20)	$356,868
1275-22000-122-00D Term. date: 09/30/00	Development of On-line Systematics Resources about Fungi and the U.S. National Fungus Collections	D. Farr (.50) A. Rossman (.30)	$244,366
1275-22000-130-00D Term. date: 09/30/00	Systematics of Plant Pathogenic Fungi Important to Agriculture	D. Farr (.50) A. Rossman (.20)	$226,213
1275-22000-105-00D Term. date: 09/30/99	Systematics of Fungi Important in Biological Control: *Hypocrea* and its anamorphs *Trichoderma* and *Gliocladium*	G. Samuels (1.00) A. Rossman (.20)	$211,843
1275-22000-112-00D Term. date: 11/12/97	Molecular Genetics of Populations of Fungi Important in Biological Control	S. Mischke (1.00) A. Rossman (.10)	$164,134

OUTSIDE FUNDING

CRIS #/LOG #	TITLE	SY(s)	SOURCE OF FUNDS
1275-22000-130-01R Term. date: 09/30/00	Technical Support for Research on the Systematics of Plant Quarantine Significant Fungi	A. Rossman	$21,368
1275-3900-08045 Term. date: 09/01/97	Nomenclatural Research on Plants of Foreign Origin	J. Wiersema	$10,000

Account Code: 701-1275-139 Syst. Botany & Mycology Lab
Mode Code: 03-10-12-1275-39-00-00-00
MU Name: SYST BOTANY & MYCOLOGY LAB
Location Name: Plant Sciences Institute
Area Name: BELTSVILLE AREA
Agency: 03 This MU occupies only Federal space

Distr. of Resources	Pos Cat	Obj Cls	Prior Year Dollars	Prior Year FTE	Current Year Dollars	Current Year FTE	Difference Dollars	Difference FTE	CRIS/IRC Distribution	
Personal Services									1275-21000-111-00D	29.20%
Scientific Effort									1275-22000-105-00D	17.12%
Research Scientist	1	1000	392,749	5.00	400,996	5.00	8,247		1275-22000-112-00D	12.33%
Service Scientist	4	1000	73,133	1.00	76,271	1.00	3,138		1275-22000-122-00D	17.10%
Support Effort									1275-22000-130-00D	24.24%
Non Perm Res/Serv Sci.	2	6000								
Support Scientist	3	6000	45,127	1.00	45,936	1.00	809			
Technician/Aid/Asst	5	6000								
Specialist	6	6000								
Technician/Aid (Eng. & Sci.)	7	6000	34,000	0.80	64,450	1.60	30,450	0.80		
Trades & Crafts	8	6000								
Admin. Support	9	6000	84,306	2.50	85,517	2.50	1,211			
(Other)		6000	55,478	2.40	27,750	1.50	-27,728	-0.90		
Overtime										
Premium Pay										
Promotion/Award/QSI/Merit Pay			5,000		3,000		-2,000			
PERSONNEL SUBTOTAL			689,793	12.70	703,920	12.60	14,127	-0.10		
Travel of Persons		2100	4,500		4,000		-500			
Transportation		2200	563		675		112			
Rent, Comm., Utilities		2300	11,500		9,500		-2,000			
Printing & Reproduction		2400								
Contract & Other Services		2500	7,435		4,010		-3,425			
Repair & Maintenance		2530	16,744		17,139		395			
Research Support Agreement		2554		0.80				-0.80		
Supplies and Materials		2600	210,071		181,927		-28,144			
Equipment		3100			43,000		43,000			
Land & Structure		3200								
Extramural		4000	50,419				-50,419			
ALL OTHER - SUBTOTAL			301,232	0.80	260,251		-40,981	-0.80		
TOTAL			991,025	13.50	964,171	12.60	-26,854	-0.90		
BASE FUNDS			916,933		890,082		-26,851			
Management Criteria										
Percent in Salaries				54.16%		55.10%		0.94%		
Target Percent in Salary						62.00%		62.00%		
Support Years per SY				1.12		1.10		-0.02		
Total Dollars per SY			212,274		212,918		644			
Discretionary Funds per SY			37,095		38,935		1,841			
Percent Discretionary				17.47%		18.29%		0.81%		
										100.00%

REMARKS: IRCA $313,339. Recruitment Incentives under Demo Project - $0

Amy Rossman 8-28-96 P.D. Mundell SEP 04 1996

FUNDHOLDER - Amy Rossman DATE APPROVING OFFICIAL DATE TELEPHONE NO.

PFK

Account Code: 708-1275-139 Systematic Botany & Nemat Lab
Mode Code: 03-10-12-1275-39-00-00-00
MU Name: SYST BOTANY & MYCOLOGY LAB
Location Name: Plant Sciences Institute
Area Name: BELTSVILLE AREA
Agency: 03 This MU occupies only Federal space

Distr. of Resources	Pos Cat	Obj Cls	Prior Year Dollars	Prior Year FTE	Current Year Dollars	Current Year FTE	Difference Dollars	Difference FTE	CRIS/IRC Distribution	
Personal Services									1275-39000-080-45R	29.85%
Scientific Effort									1275-39000-105-14R	70.15%
Research Scientist	1	1000								
Service Scientist	4	1000								
Support Effort										
Non Perm Res/Serv Sci.	2	6000								
Support Scientist	3	6000								
Technician/Aid/Asst	5	6000								
Specialist	6	6000								
Technician/Aid (Eng. & Sci.)	7	6000			21,368	0.60	21,368	0.60		
Trades & Crafts	8	6000								
Admin. Support	9	6000								
(Other)		6000	13,355	0.50			-13,355	-0.50		
Overtime										
Premium Pay										
Promotion/Award/QSI/Merit Pay			500		500					
PERSONNEL SUBTOTAL			13,855	0.50	21,868	0.60	8,013	0.10		
Travel of Persons		2100								
Transportation		2200								
Rent, Comm., Utilities		2300								
Printing & Reproduction		2400								
Contract & Other Services		2500								
Repair & Maintenance		2530								
Research Support Agreement		2554								
Supplies and Materials		2600	9,468		11,632		2,164			
Equipment		3100								
Land & Structure		3200								
Extramural		4000								
ALL OTHER - SUBTOTAL			9,468		11,632		2,164			
TOTAL			23,323	0.50	33,500	0.60	10,177	0.10		
BASE FUNDS										
Management Criteria										
Percent in Salaries				46.18%		65.28%		19.09%		
Target Percent in Salary										
Support Years per SY										
Total Dollars per SY										
Discretionary Funds per SY										
Percent Discretionary				53.82%		34.72%		-19.09%		
										100.00%

REMARKS: IRC = $0 . Recruitment Incentives under Demo Project = $0

Amy G. Rossman 8-28-96 Patricia Munch SEP 04 1996

FUNDHOLDER - Amy Rossman DATE APPROVING OFFICIAL DATE TELEPHONE NO.

Account Code: 708-1275-139 Systematic Botany & Nemat Lab
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Distr. of Resources	Pos Cat	Obj Cls	Prior Year Dollars	Prior Year FTE	Current Year Dollars	Current Year FTE	Difference Dollars	Difference FTE	CRIS/IRC Distribution	
Personal Services									1275-39000-080-45R	29.85%
Scientific Effort									1275-39000-105-14R	70.15%
Research Scientist	1	1000								
Service Scientist	4	1000								
Support Effort										
Non Perm Res/Serv Sci.	2	6000								
Support Scientist	3	6000								
Technician/Aid/Asst	5	6000								
Specialist	6	6000								
Technician/Aid (Eng. & Sci.)	7	6000			21,368	0.60	21,368	0.60		
Trades & Crafts	8	6000								
Admin. Support	9	6000								
(Other)		6000	13,355	0.50			-13,355	-0.50		
Overtime										
Premium Pay										
Promotion/Award/QSI/Merit Pay			500		500					
PERSONNEL SUBTOTAL			13,855	0.50	21,868	0.60	8,013	0.10		
Travel of Persons		2100								
Transportation		2200								
Rent, Comm., Utilities		2300								
Printing & Reproduction		2400								
Contract & Other Services		2500								
Repair & Maintenance		2530								
Research Support Agreement		2554								
Supplies and Materials		2600	9,468		11,632		2,164			
Equipment		3100								
Land & Structure		3200								
Extramural		4000								
ALL OTHER - SUBTOTAL			9,468		11,632		2,164			
TOTAL			23,323	0.50	33,500	0.60	10,177	0.10		
BASE FUNDS										
Management Criteria										
Percent in Salaries				46.18%		65.28%		19.09%		
Target Percent in Salary										
Support Years per SY										
Total Dollars per SY										
Discretionary Funds per SY										
Percent Discretionary				53.82%		34.72%		-19.09%		
										100.00%

REMARKS: IRC = $0 Recruitment Incentives under Demo Project = $0

Amy G. Rossman 8-28-96 for R. Munell SEP 04 1996

FUNDHOLDER - Amy Rossman DATE APPROVING OFFICIAL DATE TELEPHONE NO.

	Total		1275-39000-080-45R			1275-39000-105-14R		
Salaries:	FTE	Dollars	%	FTE	Dollars	%	FTE	Dollars
Rossman, Amy	0.00	0	0.00%	0.00	0	100.00%	0.00	0
SY Salary Subtotal	0.00	0	------	0.00	0	------	0.00	0
Prmtn/Awrd/QSI/Merit Pay Bonus		0	0.00%		0	0.00%		0
TOTAL SY	0.00	0	------	0.00	0	------	0.00	0
Schultheiss, Rebecca	0.60	21,368	0.00%	0.00	0	100.00%	0.60	21,368
Non-SY Salary Subtotal	0.60	21,368	------	0.00	0	------	0.60	21,368
Overtime		0	0.00%		0	0.00%		0
Premium Pay		0	0.00%		0	0.00%		0
Prmtn/Awrd/QSI/Merit Pay Bonus		500	0.00%		0	100.00%		500
Non-SY Other Subtotal		500	------		0	------		500
TOTAL Non-SY	0.60	21,868	------		0	------		21,868
SUBTOTAL - ALL SALARIES	0.60	21,868	------	0.00	0	------	0.60	21,868

	Total		1275-21000-111-00D			1275-22000-105-00D		
Salaries:	FTE	Dollars	%	FTE	Dollars	%	FTE	Dollars
Farr, David	1.00	70,505	0.00%	0.00	0	0.00%	0.00	0
Kirkbride, Joseph	1.00	77,736	100.00%	1.00	77,736	0.00%	0.00	0
Mischke, Barbara	1.00	69,438	0.00%	0.00	0	0.00%	0.00	0
Rossman, Amy	1.00	94,353	20.00%	0.20	18,871	20.00%	0.20	18,871
Samuels, Gary	1.00	88,964	0.00%	0.00	0	100.00%	1.00	88,964
Wiersema, John	1.00	76,271	100.00%	1.00	76,271	0.00%	0.00	0
SY Salary Subtotal	6.00	477,267	------	2.20	172,878	------	1.20	107,835
Prmtn/Awrd/QSI/Merit Pay Bonus		2,000	25.00%		500	75.00%		1,500
TOTAL SY	6.00	479,267	------	2.20	173,378	------	1.20	109,335
Alessandrini, Loretta	0.50	15,439	0.00%	0.00	0	0.00%	0.00	0
~~Bush, Kathryn~~	~~0.40~~	~~11,396~~	~~0.00%~~	~~0.00~~	~~0~~	~~0.00%~~	~~0.00~~	~~0~~ Term. 9/30/97
Edinger, Eleanor	1.00	37,480	0.00%	0.00	0	0.00%	0.00	0
Garland, Kelly	0.50	9,155	0.00%	0.00	0	100.00%	0.50	9,155
Gilbert, Leslie	0.50	10,280	100.00%	0.50	10,280	0.00%	0.00	0
Gladish, Harriet	1.00	32,598	20.00%	0.20	6,520	20.00%	0.20	6,520
Irvin, Sasha	0.50	8,315	100.00%	0.50	8,315	0.00%	0.00	0
Plaskowitz, James	0.80	44,336	10.00%	0.08	4,434	25.00%	0.20	11,084
Schultheiss, Rebecca	0.40	8,718	0.00%	0.00	0	0.00%	0.00	0
~~Spjut, Richard~~	~~1.00~~	~~45,936~~	~~100.00%~~	~~1.00~~	~~45,936~~	~~0.00%~~	~~0.00~~	~~0~~ Retired 3/29/97
Non-SY Salary Subtotal	6.60	223,653	------	2.28	75,485	------	0.90	26,759
Overtime		0	0.00%		0	0.00%		0
Premium Pay		0	0.00%		0	0.00%		0
Prmtn/Awrd/QSI/Merit Pay Bonus		1,000	20.00%		200	10.00%		100
Non-SY Other Subtotal		1,000	------		200	------		100
TOTAL Non-SY	6.60	224,653	------		75,685	------		26,859
SUBTOTAL - ALL SALARIES	12.60	703,920	------	4.48	249,063	------	2.10	136,194

FUTURE-YEAR PROJECTIONS

IN PSI

04/18/97

MU NAME: Systematic Botany and Mycology Lab

Initials: RL_____ AO_____

		FY 1997	FY 1998	FY 1999
BASE FUNDS (Net to Location) (Excludes 0500 funds unless authorized by ID) If 0500 funds are authorized, indicate total amount in a footnote. FY98 temp funds for Hdqtrs Post Doc		$1,203,421	$1,253,421	$1,203,421
FEDERAL SALARIES (include WGI's, promotions, retirements, replacements, merit pay, etc.)		$630,920	$674,878	$661,406
Explanation of Variance to ARMPS: FY97 removes estimates for awards				
FY97 includes $25000 for pos 2B9458				
FY99 removes salary need for 7B9304				
FY98 includes $50000 for 2B9458				
% assumed increase from '97-'98 & from '98-'99			3.00%	3.00%
BIOTECHNOLOGY ASSESSMENT (Current FY ONLY)		$911		
RSA SALARIES AND UTILITIES		$0	$	$
INDIRECT RESEARCH COSTS		$313,339	$322,739	$332,421
Inflation rate used for IRC			3.00%	3.00%
INTERNAL INDIRECT RESEARCH COSTS		$0	$	$
Inflation rate - to be provided by Management Analyst			%	%
OTHER FIXED COSTS		$22,880	$21,702	$22,364
Hazardous Waste Disposal	$200			
Radiological Waste Disposal	$0			
Postage	$5,500			
Greenhouse Surveillance	$0			
Telephones	$4,000			
Maintenance Contracts	$10,000			
Gasoline Credit Card Purchases	$0			
Occupational Health Maintenance	$200			
Incinerator Costs	$0			
Head Tax ($80/FTE)	$880			
Radiological Safety Staff Assessment	$1,800			
Inflation factor			3.00%	3.00%
MANDATORY EXTRAMURAL AND OTHER DIRECTED TRANSFERS OF FUNDS (Mandated by Congress or NPS) FOR WHICH TEMPORARY FUNDING HAS NOT BEEN PROVIDED		$	$	$
BALANCE AVAILABLE (Discretionary)		**$235,371**	**$234,102**	**$209,594**
SY's (Do not round off)		6	6	6
DISCRETIONARY $'s PER SY		**$39,229**	**$39,017**	**$34,932**

General Notes:

Use FY 1997 base funds for FY 1998 and FY 1999 (assume no increases).

Do not include soft funds or "0500" CRIS Unit funds or costs unless approved by ID and footnoted.

Proposals for resolving underfunding problems must be addressed on a separate page.

Any information you include will be restricted to use in the Area Director's office ONLY. Do not use solutions to performance problems to resolve funding problems.

If a retirement is going to be used to resolve funding shortages, what will be the backup plan should the retirement not occur?

Budget Increase Proposals

Emerging Diseases/Exotic Pests

Develop a baseline molecular and morphological account of bunt fungi on native, weedy, and horticultural grasses and grass crops (wheat, rice, ryegrass, barley, sugarcane, barley, oats, rye) in the United States. $300,000

Develop strategies for accelerated identification and diagnosis of bunt fungi on native, weedy, and horticultural grasses and grass crops (wheat, rice, ryegrass, barley, sugarcane, barley, oats, rye) in the United States. $300,000

Integrated Initiative on Molecular Systematics of Emerging Diseases

SBML/SEL/NL $800,000 for 2 SYs working w/ specialists

Develop strategies for accelerated identification and diagnosis of emerging diseases and pests of major crops based on molecular systematics.

Grazing Lands/Emerging Diseases/Action Agencies

Develop strategies to manipulate fungi on ryegrass including mycotoxin-producing endophytes, bunt fungi, and other quarantine-significant fungal diseases using molecular systematics.
$300,000

Genetic Resources

Predict the origin and usefulness of crop germplasm based on molecular systematic knowledge of phylogenetic relationships among species of agriculturally important plants.
$600,000

Genetic Resources/Biocontrol

Develop an ex situ collection of mycoparasitic fungi having biocontrol potential with an on-line database of their associated attributes to expedite the use and development of alternative control agents.
$600,000

Sustainable Agriculture

Develop strategies to manipulate mulch fungi in sustainable agricultural systems to increase available crop nutrients and productivity based on systematic knowledge of these fungi.
$300,000

Floral/Nursery Crops

Provide nomenclature of horticultural and ornamental crops as an on-line database of accurate scientific and common names.

$300,000

Proposal to support APHIS and AMS

Develop artificial intelligence systems for the analysis of crop and weed seeds, emphasizing image analysis and computer images for their characterization.

$300,000

Proposal in support of APHIS

Develop an on-line database and identification system of plant-associated fungi reported worldwide and their hosts to expedite accurate quarantine regulatory decisions.

$300,000

RESPONSE TO RECOMMENDATIONS FROM PREVIOUS REVIEW

Recommendation: Based on the success of the program combining expertise in molecular systematics with a specialist (Drs. Samuels with research associate Dr. Rehner), those at the previous Brief Laboratory review in April, 1995 suggested that increased funds be made available to hire a permanent SY to develop a molecular systematics program complementary to that of the research specialists.

Response: Dr. Rossman has worked to increase an understanding of the importance of systematics in agriculture research through various publications in an attempt to obtain increased funding for a molecular systematics component in the Laboratory. Such funds have not been forthcoming. Meanwhile, an automated sequencer has been purchased and an outstanding technician is now providing support in molecular systematics.

Recommendation: Provide funding for additional technical support to scientists through new resources associated with the Genetics Resources Program and create new biological and computer support positions as well as a full-time mycologist applying molecular techniques to mycological problems.

Response: Support personnel in the SBML are still minimal consisting primarily of part-time, temporary positions. Despite this, research productivity remains high. Dr. David Farr has successfully placed on-line many of the electronic resources for fungal systematics. The need for molecular expertise remains crucial, particularly with the loss of Dr. Steven Rehner who has also contributed enormously to the research programs of both Dr. Samuels and Dr. Uecker, now retired.

Implementation of the ARS Six-year Objectives

The broad high-priority research areas of emphasis in plant production, plant protection and soil for ARS during the 1992-1998 period as they to the Systematic Botany and Mycology Laboratory are implemented through the following approaches.

2--Plant Productivity

Develop technology for increasing plant productivity and quality.

2.1 Plant Productivity

Improve the production efficiency of plants and quality of plant products.

2.1.1-Germplasm Collections and Biosystematics

Increase potential for germplasm utility through acquisition, characterization, documentation, and preservation activities, including related systematic, ecogeographical, and conservation research.

2.2. Plant Protection

Control pathogens, nematodes, insects, motes, and weeds to sustain or improve production efficiency in ways that will maintain or enhance natural resources and the environment.

2.2.1-Pathogens and Nematodes

Develop improved technology to prevent, reduce or eliminate losses from pathogens and nematodes.

As can be seen from the Contributions from Scientists which follow, all of our research falls under these approaches and are directed toward fulfilling ARS objectives in high-priority research areas.

Contributions from

Systematic Botany and Mycology Laboratory

Scientific Staff

(1995-April, 1997)

I. **DAVID F. FARR**
Research Botanist (Mycologist)

II. **Research Progress and Plans**

CRIS Project: 1275-22000-022-00D (0.5 FTE)
Systematics of Plant Pathogenic Fungi Important to Agriculture

Objectives

Conduct systematic studies of *Septoria*, *Stagonospora*, related genera, and their teleomorphs with emphasis on those of plant-quarantine significance. Provide identification and solve taxonomic problems of coelomycetous fungi submitted for identification.

Progress

* In the spring of 1995, cantaloupes, honeydew and watermelons growing in the lower Rio Grande Valley region of Texas were almost completely destroyed by a disease of unknown origin. The causal agent was isolated from melon roots and determined to be a coelomycetous fungus not previously known to science. This fungus has been described and illustrated as a new genus and species. As a result it is now possible to identify the fungus that is destroying melons in this region and to develop a control strategy for the disease.

* A fungus on an ornamental grass was identified as a coelomycete related to *Stagonospora*. Because this fungus infected sugarcane, it was studied and characterized as well as determining its pathogenicity to a range of related grasses. It was determined to be an unidentified species of *Leptosphaeria* having a *Stagonospora* asexual state. The study of disease and its causal agent was published for use by those who encounter this disease.

Plans

* Future studies will emphasize *Septoria* on monocotyledonous hosts including orchids and grasses particularly those species that represent the transition between *Septoria* and *Stagonospora*. Study of the two most important diseases of wheat, namely glume blotch caused by *Stagonospora nodorum* (teleomorph *Phaeosphaeria nodorum*) and wheat leaf disease caused by *Septoria tritici* (teleomorph *Mycosphaerella graminicola*) will serve as the basis for making the distinction between these genera. Cultures are being accumulated for this study. The technician with molecular expertise will work on this project. About 50% of Dr. Farr's time will be spenton this project starting in October, 1997. This project is anticipated to take two years.

CRIS Project: 1275-22000-021-00D (0.5 FTE)
Computerization and Development for the U.S. National Fungus Collections for Agriculture

Related CRIS Project: 1275-22000-021-01R
Pilot Computer Database of Exotic Fungi on High Priority Plant Risk Assessments

Objectives

Develop on-line resources for fungi important to agriculture. Computerize the specimen data in the U.S. National Fungus Collections and generate information needed for mycologists, plant regulatory officials, and others upon request. Develop a database on fungi occurring worldwide on high-priority plant hosts. Provide taxonomic support on issues related to the systematics of plant pathogenic fungi and mushrooms as requested by government agencies and private citizens.

Progress

* Using the Internet those outside the Systematic Botany and Mycology Laboratory can access in-house databases about plant-associated fungi. The information available to users includes: 1) the database of plant-associated fungi in the United States as well as outside the U.S.; 2) the database of 14,000 references on the systematics of plant-associated fungi; 3) data on 700,000 of the one-million specimens in the U.S. National Fungus Collections; 4) 117,000 fungal names in Saccardo's, Sylloge Fungorum, and several smaller databases. Each month about 5000 customers access the database resources about fungi available over the Internet. These users vary from APHIS and extension personnel making plant regulatory decisions to national and international scientists checking the holdings of the U.S. National Fungus Collections.

* All rusts, smuts, polypores, ascomycetes, fungi imperfecti, and the C.G. Lloyd collection of the U.S. National Fungus Collections consisting of about 700,000 of the one-million specimens have been computerized. All specimens except a portion of the myxomycetes and the exsiccati have been numbered with bar-codes. Computerization of the miscellaneous basidiomycetes is on-going. All newly accessioned specimens and herbarium operations such as managing loans have been computerized.

* Fungi that occur on agricultural and horticultural crops outside the United States are a threat to U.S. agriculture. Knowledge of their geographic distribution and host range is necessary to make informed plant quarantine decisions. A database of fungi that occur outside the United States now includes about 200,000 records as well as about 12,000 scientific names of fungi on high priority hosts or of plant quarantine significance. An account of fungi reported on Rhododendron worldwide was published. All data are available on-line to outside users. These data are essential to plant regulatory officials in making risk assessments concerning the allowable importation of nursery stock, logs, and other plant material.

* APHIS maintains a list of organisms of importance to those making plant-regulatory decisions that includes about 4,000 plant-associated fungi. This list is the result of several decades of decisions yet the nomenclature and basic information about these fungi had never been evaluated. Using the database and reference resources at SBML all names of fungi were reviewed for accuracy. Their scientific names have been updated, and associated information about host, and distribution compiled into a comprehensive, useful account of fungi of plant-quarantine significance.

* About twenty to thirty fungal specimens each year are identified on an emergency basis as requested by medical personnel dealing with mushroom poisoning cases.

Plans

* At present, the entire computerized database and Internet system is being converted from the PRIME minicomputer and associated software purchased in the late 1980's to a more user-friendly MS-Access system. The new system will allow users to develop their own searches for specific information or use the standard menus. The conversion will facilitate the output of reports and publications from these data. In FY-97 Dr. Farr has been relieved of his research responsibilities to conduct this conversion. The conversion will be completed by the end of September, 1997.

* Work on computerization of specimens in the U.S. National Fungus Collections will continue until completion of the miscellaneous basidiomycetes estimated to take about one year. After that, the entry of specimen data will be substantially reduced particularly as the associated clerical personnel retire. It is expected that the management of the U.S. National Fungus Collection including processing of loan, accession of newly acquired specimens, upgrading and completion of computerization projects will be carried out by one part-time Office Automation Assistant.

* Given that a computerized database of plant-associated fungi in the U.S. already exists and that a similar database for Canada is nearly complete,plans to combine these databases are moving forward. Dr. Farr will work with Dr. Scott Redhead and others in Canada to provide a comprehensive database of plant-associated fungi in North America. At present, the Canadians are converting and correcting their data so that it can be more easily used by another system. Negotiations will begin to include data from Mexico both by entering data from printed resources and merging existing databases of Mexican fungi. The comprehensive Canadian-U.S. plant-associated database will begin development in six months and will be available for use in two years.

* Emergency requests for the identification of ingested mushrooms will continue as needed particularly from late spring to early fall.

III. Curriculum Vitae

Education

Ph.D. 1974	Virginia Polytechnic Institute & State University Major: Botany
1965-1969	University of Michigan
M.A. 1965	University of Kansas Major: Botany
B.A. 1963	Humboldt College Major: Botany

Employment History

1974 - present Research Botanist, Systematic Botany and Mycology Laboratory, previously Systematic Botany, Mycology and Nematology Laboratory/Mycology Laboratory, USDA-ARS, Beltsville, MD.

Professional Recognition

Honors and Awards

1995 Beltsville Area Technology Transfer Award

Special Invitations

Offices and Committee Assignments held in Professional & Honorary Societies

Mycological Society of America, Councilor, 1991-1994
Index Editor, Mycologia, 1986-1996
AIBS Representative, 1985-1988
International Union of Biological Sciences
Member, Committee on Names in Current Use

Collaborators

Rebecca Bech, USDA-APHIS, Riverdale, MD
Gerald Bills, Merck Research Laboratories, Rahway, NJ
Lois Brako, University of Missouri, St. Louis, MO
Harold Burdsall, U.S. Forest Service, Forest Products Laboratory, Madison, WI
Sue Cohen, USDA-APHIS, Riverdale, MD
Jack Comstock, USDA-ARS, Canal Point, FL
Hilisa Esteban, American Home, Princeton, NJ
James Ginns, Agriculture Canada, Ottawa, Ontario

Paul Kirk, International Mycological Institute, Egham, United Kingdom
Thomas Matsumoto, California Dept. of Agriculture, Sacramento
Nichole O'Neill, USDA-ARS, Beltsville, MD
Mary E. Palm, USDA-APHIS, Beltsville, MD
Scott Redlin, USDA-APHIS, Riverdale, MD
Clyde Reed, Darlington, MD

Publications (1995- April, 1997)

Brako, L., A. Y. Rossman, and D. F. Farr. 1995. *Scientific and Common Names of 7,000 Vascular Plants in the United States*. American Phytopathological Society, St. Paul, MN. 295 pp.

Farr, D. F. and G. F. Bills. 1995. *Wojnowicia colluvium* sp. nov. isolated from conifer litter. *Mycologia* 87:18-524.

Farr, D. F., H. B. Esteban, and M.E. Palm. 1996. *Fungi on Rhododendron: A World Reference*. Parkway Publishers, Boone, NC. 192 pp.

O'Neill, N. and D.F. Farr. D.F. 1996. *Miscanthus* blight, a new foliar disease of ornamental grasses and sugarcane incited by *Leptosphaeria* sp. and its anamorphic state *Stagonospora* sp. *Plant Disease* 80:980-987.

Farr, D.F. and A.Y. Rossman. 1997. Integration of data for biodiversity initiatives. pp. 475-490. In: Reaka, et al. (eds.) *Biodiversity II: Understanding and Protecting our Natural Resources*. Joseph Henry Press, Washington, D.C.

Farr, D.F. and E. Farr. 1997. Electronic information resources. Accepted for publication. In: Mueller, G., G. Bills, and H. Burdsall. *Measuring and Monitoring the Biodiversity of Fungi*. Smithsonian Institution Press, Washington, DC.

Rossman, A.Y. and D. F. Farr. 1997. Towards a virtual reality for plant-associated fungi in the United States and Canada. *Biodiversity and Conservation* 6:in press.

Farr, D.F. 1997. *Rhizophila cucumis*, a new coelomycetous fungus causing a disease on melons in the Rio Grande Valley of Texas. *Mycologia*. In prep.

I. **JOSEPH H. KIRKBRIDE, JR.**
Research Botanist

II. **Research Progress and Plans**

CRIS Project: 1275-21000-069-00D (1.0 FTE)
Systematics of Vascular Plants Important to Agriculture

Objectives

Develop a comprehensive monograph of *Lotus* subgenus *Pedrosia* (Fabaceae) with 20-25 species including coral-gem and parrot-beak. Review systematics of agriculturally important *Lotus* species (Fabaceae) and solve nomenclatural and taxonomic problems associated with this group of forage plants. Prepare worldwide checklist and distribution of *Lotus* species. Identify specimens of *Lotus* sent by researchers.

Prepare a printed manual for the accurate and rapid identification of fruits and seeds from genera of Fabaceae subfamily Faboideae and an electronic database, interactively accessible, for the identification of fruits and seeds of all genera of Fabaceae. Solve specific taxonomic problems that arise during the course of this project.

Progress

* The taxonomic literature pertaining to genus *Lotus* and tribes Loteae and Coronilleae was surveyed, and the nontaxonomic literature, especially agronomic, on *Lotus* was reviewed. Five taxa were found to be agronomically important or to be considered potentially important. Conserved specimens and photographs of the taxa were examined, descriptions prepared for them, and a key to separate and identify them prepared.

* The worldwide floristic and taxonomic literature and databases dealing with the genus *Lotus* and its segregate genera were consulted. The accepted taxa were compared, and conflicts were resolved. Results were presented as an alphabetical list of species and analphabetical list of species for each country.

* In the last ten years, it has been recognized that the name *Lotus tenuis* should be replaced by *L. glaber* Mill. *Lotus tenuis* is an agriculturally important, widely studied species, and changing its scientific name will cause widespread confusion. It was proposed to the International Association for Plant Taxonomy that the name *L. glaber* be rejected so that the name *L. tenuis* can continue to be used for narrowleaf trefoil.

* Collections of dried plant specimens of *Lotus* subgenus *Pedrosia* at the U.S. National Arboretum, Washington, D.C., Missouri Botanical Garden, St. Louis, Missouri, Smithsonian Institution, Washington, D.C., and Royal Botanic Gardens, Kew, England, have been reviewed.

Original descriptions for most of the names applied to taxa in the subgenus have been acquired, and a literature survey has been carried out.

* Approximately 125 *Lotus* specimens were received and identified.

* Selected species of all available genera have been studied. Fruits and seeds have been dissected, and drawings, photographs, and SEMs prepared for each genus. For this study 316 characters have been recorded in a DELTA database for 436 genera, and no fruits and seeds could be located for 18 genera. More than 1,000 pages of manuscript with descriptions and illustrations of a full-page plate for each genus have been produced and sent to specialists for review.

* It was discovered that the African species of *Swartzia* have mesocarp canals unlike any other genus of legumes and that the seeds are very different from the Neotropical species. The African species of *Swartzia* were described as a new genus *Bobgunnia*. The phylogenetic and phytogeographic importance of this discovery was indicated.

Plans

* Morphological data from *Lotus* subgenus *Pedrosia* will be synthesized with new data from other fields such as palynology, cytology, biochemistry, and DNA structure. A classification for the 20-25 taxa of subgenus *Pedrosia* will be developed that reflects this synthesis. An evolutionary hypothesis will also be formulated using cladistic techniques. A manuscript will be submitted for publication in 1999.

* Specimens of *Lotus* sent for identification will be identified.

* Keys to the genera will be prepared using the DELTA software system. An introduction will be written incorporating the information in the database. The manuscript will be submitted to ARS Technical Editing Unit in August of this year. The databases for the three subfamilies will be amalgamated forming a single database for approximately 660 genera of legumes. All the drawings, photographs, and SEMs will be scanned and converted to computer images, and the data for the other two subfamilies, Caesalpinioideae and Mimosoideae, updated and brought into conformity with those for the Faboideae. The database and images will be published on a CD-ROM in early 1998 and will be accessible on PCs through on-line software.

III. Curriculum Vitae

Education

Ph.D. 1975 City University of New York
Major: Botany
M.S. 1968 St. Louis University
Major: Biology
B.A. 1966 St. Louis University
Major: Biology

Employment History

1984 - Present Research Botanist, USDA-ARS, Systematic Botany and Mycology Laboratory, previously Systematic Botany, Mycology, and Nematology Laboratory/Plant Exploration and Taxonomy Laboratory, Beltsville, MD.

1983 - 1984 Adjunct Professor 2, tenured, and Curator of the University Herbarium, Department of Botany, University of Brasilia, Brasilia, Brazil.

1979 - 1983 Collaborating Professor 4, and Curator of the University Herbarium, Department of Botany, University of Brasilia, Brasilia, Brazil.

1975 - 1979 Associate Curator, Department of Botany, Smithsonian Institution, Washington, DC.

Professional Recognition

Honors and Awards

Award for Outstanding Achievement in Biological Science 1994, Washington Academy of Sciences
Research Associate, Department of Botany, Smithsonian Institution, Washington, D.C., 1979 to present
One new genus and nine new species of plants named in his honor, 1976 to 1990
USDA-ARS grant for germplasm exploration in central Brazil with W. W. Roath, 1989

Special Invitations

International Symposium on NitrogenFixing Trees for the Tropics, EMBRAPA, Rio de Janeiro, Brazil, September, 1983. "Legumes of the Cerrado (Leguminosas lenhosas de occurncia no Cerrado)."

Cucurbitaceae 89: Evaluation and Enhancement of Cucurbit Germplasm, Charleston, South Carolina, November, 1989. "Taxonomic considerations in the genus Cucumis in relation to germplasm enhancement."

XV International Botanical Congress, Yokohama, Japan, September, 1993. Symposium on Ovules and Seeds: Structure, Function and Taxonomy. "Phylogenetic implications of seeds and fruits of Caesalpinioideae and Mimosoideae (Fabaceae)."

Offices and Committee Assignments Held in Professional & Honorary Societies

Botanical Society of Washington
Vice President, 1990
President, 1991
American Society of Plant Taxonomists
Member of the Committee for Environmental and Public Policy, 1986-1987.

Other Significant Data

Collaborating Scientist for the PL-480 projects preparing the Flora of Pakistan, 1984-1991.
Co-Editor, Bean Bag (a newsletter to promote communication among research scientists concerned with the systematics of the Fabaceae), 1986-1996.
Member, Program Committee and Organizer of the Computer Demonstrations for Beltsville Symposium XIII, Biotic Diversity and Germplasm Preservation - Global Imperatives, 1988.
Attended 2nd Workshop, International Legume Database & Information Service (ILDIS), Southampton, England, September 1988.
Planned, organized, and managed moving the U.,S. National Seed Herbarium with more 110,000 samples from Building 265 to Building 011A, BARC, Beltsville, 1993.

Collaborators

Rupert C. Barneby, New York Botanical Garden, New York
Paul R. Beuselinck, USDA, ARS, University of Missouri
Frank A. Bisby, The University, Southampton, England
Stephanie L. Greene, USDA, ARS, Washington State University
Charles R. Gunn, Brevard, NC (ARS retired)
Roger M. Polhill, Royal Botanic Gardens, Kew
Jeffrey J. Steiner, USDA, ARS, National Seed Production Research Center
Anna L. Weitzman, Department of Botany, Smithsonian Institution

Publications (1995 - April, 1997)

Kirkbride, J. H., Jr. 1995. (1165) Proposal to reject the name *Lotus glaber* Mill. (Leguminosae). Taxon 44(3): 423-424.

Kirkbride, J. H., Jr. and J. H. Wiersema. 1997. *Bobgunnia*, a new African genus of tribe Swartzieae (Fabaceae, Faboideae). *Brittonia* 49(1): 1-23.

Kirkbride, J. H., Jr. 1997. Manipulus rubiacearum - VII. *BioLlania*, in press.

Kirkbride, J. H., Jr. 1997. Systematics and Distribution. *In*: P.R. Beuselinck, ed., *Trefoil: the Science and Technology of the* Loti. Agronomy Monograph Series, in press.

Kirkbride, J. H., Jr. 1997. Checklist of *Lotus* Species. *In*: P.R. Beuselinck, ed., *Trefoil: the Science and Technology of the* Loti. Agronomy Monograph Series, in press.

Kirkbride, J. H., Jr. 1997. Distribution of *Lotus* Species by Country. *In*: P.R. Beuselinck, ed., *Trefoil: the Science and Technology of the* Loti. Agronomy Monograph Series, in press.

Kirkbride, J. H., Jr. 1997. Manipulus rubiacearum - VI. *Brittonia*, in press.

Non peer-reviewed:

Lichtenfels, J. R., J. H. Kirkbride, Jr. and D. J. Chitwood. 1996. Systematics collections of the Agricultural Research Service. *Association of Systematics Collections Newsletter* 24(3): 33-40.

I. **B. SUE MISCHKE**
Research Geneticist

II. **Research Progress and Plans**

CRIS Project Number: 1275-22000-112-00D (1.0 FTE)
Molecular Genetics of Populations of Fungi Important in Biological Control

Species of *Sclerotinia* are fungal pathogens that cause plant diseases resulting in crop loss. These fungi can survive in a field for many years as dormant sclerotia. Because they infect a wide range of plants, they are difficult to control by crop rotation, and in some cases an infested field must be abandoned. *Sporidesmium sclerotivorum* is a beneficial fungus and an obligate mycoparasite. When added to a field full of sclerotia of *Sclerotinia*, it can clean it up by destroying the sclerotia. The mycoparasite has great potential for biocontrol, but little is know of its biology and systematics.

Objectives

Determine characteristics of populations of fungi useful in biological control focusing on mycoparasites of sclerotia-forming fungal pathogens. Develop and apply effective and appropriate methodologies for determination of genotypic polymorphisms in *Sporidesmium sclerotivorum* and related mycoparasites. Characterize the genetic basis for the mycoparasitic relationship between fungi with potential for biological control agents and their host fungi.

Progress

* Discovered chemical signal that stimulates germination of biocontrol mycoparasite is produced by pathogens in clade of Sclerotiniaceae producing determinate sclerotia, but not necessarily by fungi in non-determinate clade of Sclerotiniaceae. Signal could not be found in sclerotia of fungi outside of this family. Discovered new host of *Sporidesmium sclerotivorum*. Discovered morphological responses of germinating spores of mycoparasites to chemical and physical signals.

* Strains of *Sporidesmium sclerotivorum* and related mycoparasitic dematiaceous hyphomycetes were isolated from soils, and a majority of strains were recovered from a neglected culture collection of biocontrol fungi. Parameters affecting viability of mycoparasites after storage have been determined. The phenotypic character analysis of Sp. *sclerotivorum* strains has been initiated.

* Developed method to culture obligate mycoparasites, with physical separation from hosts, so that parasite can be harvested without being contaminated by host DNA. This methodology was required to amplify mycoparasite DNA by PCR. It is also useful as a method appropriate for commercial production of *Sp. sclerotivorum* as a biocontrol agent.

* Developed methodology to recover DNA competent for PCR analysis. Determined primers that could be used for random amplification of polymorphic DNA (RAPD) in Sp. sclerotivorum and PCR methodology needed to ascertain relationships among strains and affiliated species by analysis of genotypic polymorphisms. Determined conditions necessary to sequence internally transcribed sequences (ITS) of *Sp. sclerotivorum* ribosomal DNA.

Plans

* Biomass will be produced from remaining strains that will grow within time constraints of project; DNA will be isolated and purified; RAPD analysis will be performed. New methodologies will be described and prepared for publication within six months.

* Data concerning growth and viability of mycoparasites, and morphological responses of germinating spores to signals will be analyzed to determine if information in each area is sufficient to support publishable manuscript within six months.

* Manuscripts will be written to document method of preventing plant disease and patent rights will be pursued, as advised by ARS technology transfer office within six months.

III. Currivulum Vitae

Education

Ph. D. 1973	The University of Arizona, Tucson
	Major: Genetics; Minor; Botany
1968-1969	The University of Arizona, Tucson
	Major: Biology; Minor: Education
	Arizona Teaching Certificate awarded
B. A. 1966	University of Colorado Boulder
	Major: Anthropology; Minor: Zoology

Employment History

1993 - present USDA-ARS, Systematic Botany and Mycology Laboratory, Beltsville, MD, GS-12 Research Geneticist

1985 - 1993 USDA-ARS, Soilborne Disease Laboratory/Biocontrol of Plant Disease Laboratory, Beltsville, MD, GS-11/12 Research Geneticist

1983 - 1985 USDA-ARS, Tissue Culture & Plant Molecular Biology Laboratory, Beltsville, MD, GS-11 Research Geneticist (Research Associate)

1981 - 1982 Department of Plant Pathology, University of California, Davis Postgraduate Research Plant Pathologist

1979 - 1981 Department of Zoology, Ohio Wesleyan University, Delaware, Ohio, Research Associate

1978 - 1979 Eleanor Roosevelt Institute for Cancer Research, University of Colorado School of Medicine, Fellow of the Institute.

1973 - 1974 Michigan Cancer Foundation, Detroit, Research Associate

Professional Recognition

Honors and Awards

NDEA Title IV Fellowship (1969-1972, fees and stipend)
Outstanding Young Women of America, 1970
University of Arizona Predoctoral Fellowship (1972-1973, Tuition, fees and stipend)
T.W. Edminster Research Associate Award, USDA-ARS, 1983
Awarded funding for USDA-ARS Administrator's Research Associate Proposal, 1987, $43,000
USDA Certificate of Merit for Outstanding Efforts in Safety, 1991, $250

Collaborators

Pete Adams, retired USDA-ARS, Grantsville, MD
Phyllis Martin, USDA-ARS, Beltsville, MD
Robert F. Schroeder, USDA-ARS, Beltsville, MD
John Cascino, Sylvan America, Inc., Cabot, PA

Publications (1995-April, 1997)

Mischke, Sue, C. F. Mischke and P. B. Adams, 1995. A rind-associated factor from sclerotia of *Sclerotinia* minor stimulates germination of a mycoparasite. *Mycologia Research* 99:1063-1070.

Mischke, S. and P. Adams. 1996. Temporal and spatial factors affecting germination of macroconidia of *Sporidesmium sclerotivorum*. *Mycologia* 88: 271-277.

Broker, N., C. Mischke, C. Patterson, S. Mischke, W. L. Bruckart, and J. Lydon. 1996. Biological activity of bar-transformed *Colletotrichum gloeosporioides* f. sp. *aeschynomene*. *Biological Control* 7:159-166.

Mischke, Sue, 1996. Evaluation of chromogenic substrates for measurement of protease production by biocontrol strains of *Trichoderma. Microbios* 87:175-183

Mischke, S. 1997. A quantitative in vitro bioassay for antagonistic activity of metabolites produced by filamentous fungi. *Mycopathologia:* in press.

Research Currently Under Consideration for Patent; Manuscripts in Preparation:
"Use of ... on ... to prevent disease and ..." (Docket Number 0002.97, Approved March, 1997); Inventors: R. F. Schroeder, P. A. W. Martin, S. Mischke.

I. **AMY Y. ROSSMAN**
Supervisory Research Botanist (Mycologist)

II. **Research Progress and Plans**

CRIS Project Number: 1275-22000-022-00D (0.2 FTE)
Systematics of Plant Pathogenic Fungi Important to Agriculture

Objectives

Characterize all genera of the Hypocreales and develop a key for their identification. Identify specimens of fungi sent by extension agents and researchers and respond to requests for research on plant pathogenic fungi as they arise.

Progress

* Integration of morphological with molecular data is essential for understanding the relationships among species in the Hypocreales and determining meaningful generic concepts. An evaluation of these data resulted in a preliminary account of the value of reviewing morphological characteristics and combining data from both the sexual and asexual states of these fungi. This research will be useful to those attempting to control diseases, develop biocontrol agents, or otherwise understand and use members of this large group of fungi.

* Genera in the ascomycete order Hypocreales include numerous plant pathogens yet their systematics is relatively unknown. The 192 genera reported to belong to the Hypocreales have been reevaluated based on a study of existing type specimens. About one-third of the genera have been found to be non-hypocrealean fungi belonging to other orders of Ascomycetes. The remaining genera are placed within three families of the Hypocreales. Descriptions and illustrations have been developed for most of the included and excluded genera of the Hypocreales with a synopsis of the disposition of all species described in each genus. In addition, a key has been written. This work will be published as a comprehensive account of all genera included in the Hypocreales as well as those that have been excluded for that order.

* About twenty specimens were sent and were identified. Numerous inquiries relating to the systematics of plant pathogenic and other fungi were addressed. Some of those requesting information are listed in Appendix A.

* A specimen from the Mid-West on an ornamental plant was determined to be a fungus previously known only from Asia. Although the plant was not killed by the fungus, the pathogen destroyed the hairs resulting in a loss of value. This new report for the United States was published on-line and in *Plant Disease* so that growers and extension agents are alerted to the presence of this fungus.

* The report of the karnal bunt (*Tilletia indica*) in the United States resulted in increased interest in the Ustilaginales or smut and bunt fungi. Information about *T. indica* and its relatives was provided as requested based on the literature and specimen data from the U.S. National Fungus Collections. An ARS administrator's postdoctoral project was written and funded to provide an on-line identification system for *T. indica* and related fungi. Dr. Lisa Castlebury, a Research Associate, was hired in January, 1997.

Plans

* An introduction will be written that explains the recent history of the Hypocreales as well as the taxonomic characteristics useful in distinguishing the genera. About 20 additional specimens must be examined, described and illustrated. The key will be reviewed and tested by non-specialists. Literature references must be checked. A completed book-length publication on the genera of the Hypocreales will be ready for review and submitted for publication within one year.

* Specimens sent for identification will be passed on to specialists or identified myself as determined by preliminary identification. Information will be provided to users as requested and within the resources available (ongoing).

* Fundamental systematics research on the bunt fungi will be continued by Dr. Lisa Castlebury with emphasis on species of *Tilletia* and similar species (see under Castlebury).

CRIS Project Number: 1275-22000-021-00D (0.5 FTE)
Computerization and Development of the U.S. National Fungus Collections for Agricultural Research

Objective

Serve as the Director of the U.S. National Fungus Collections to ensure that loans and information are provided to scientists throughout the world.

Progress

* The U.S. National Fungus Collections serves as a reference resource for scientists throughout the world. From 1995-1997, specimens have been loaned to about 200 institutions for use by mycologists, plant pathologists and other scientists concerned with fungi. Records have been updated as loans are made and returned with a special request for overdue loans sent annually. Type specimens sent for deposit are accessioned as the names are published.

* All herbarium operations have been computerized. Data on newly accessioned specimens are computerized prior to insertion into the NFC. All sections have been numbered and bar-coded with recent progress in bar-coding the Agaricales, the Myxomycetes and selected exsiccati. Computerization of the last section of miscellaneous basidiomycetes is continuing.

* Researchers are having success in extracting nucleic acids from fungal specimens in the U.S. National Fungus Collections. As Curator of the U.S. National Fungus Collections, I have communicated with those requesting permission to undertake this activity about the need to conserve material and report results of this type of work. Recent successes in extracting nucleic acids are reported from specimens of *Phytophthora infestans*, cause of potato late blight, and members of the Ustilaginales (smut and bunt fungi). With the development of this technical ability, the value of these historical collections is greatly increased.

* Knowledge of the presence, distribution and hosts of plant-associated fungi in North America is needed to further the goals of the North American Free Trade Agreement (NAFTA) as well as to service the resource needs of action agencies, primarily APHIS. The value and feasibility of developing a database of plant-associated fungi known from United States and Canada was assessed. It was determined that there is from 50-80% overlap in the plant-associated fungi in the United States and Canada for fungi groups included in the study. Given that a computerized database of plant-associated fungi in the U.S. already exists and that a similar database for Canada is nearly complete, plans to combine these databases are moving forward.

Plans

* Specimens will be accessioned as they are submitted by scientists throughout the world with priority given to type specimens. Herbarium specimens will continue to be upgraded and computerized. It is anticipated that the miscellaneous basidiomycetes will be completed within the next six months. This will complete computerization of the specimen data for the groups of fungi that are important to agriculture. The U.S. National Fungus Collections will continue to serve as an international reference resource.

III. Curriculum Vitae

Education

Ph.D. 1974 Oregon State University
Major: Mycology
B.A. 1968 Grinnell College, Grinnell, IA
Major: Biology

Employment History

1983 - Present Research Leader, Systematic Botany and Mycology Laboratory, previously Systematic Botany, Mycology and Nematology Laboratory, and Mycology Laboratory, USDA-ARS, Beltsville, MD.

1980 - 1983 Staff Specialist (Mycologist), USDA-Animal and Plant Health Inspection Service, Beltsville, MD.

1979 - 1980 Postdoctoral Research Fellow, New York Botanical Garden, Bronx, NY.

1977 - 1979 Anna Jenkins Postdoctoral Fellow, Plant Pathology Department, Cornell University, Ithaca, NY.

1974 - 1976 Research Associate, USDA-Forest Service, Pacific Northwest Range & Experiment Station, Corvallis, OR.

Professional Recognition

Honors and Awards

Gertrude Burlingham Scholarship, New York Botanical Garden, 1971.
Lawrence Memorial Grasslands Preserve Research Award, 1977.

Special Invitations

Invited speaker, International Congress of Plant Pathology, 1988
Invited speaker, International Botanical Congress, 1987.
Invited speaker, 12th International Plant Protection Congress, 1991.
Invited speaker, Symposium on Biodiversity and Terrestrial Ecosystems, Taipei, Taiwan, 1994.
Invited speaker, Microbial Diversity in Time and Space, Tokyo, Japan, 1995.
Invited speaker, Missouri Botanical Garden Annual Symposium, October, 1995.
Invited speaker, British Mycological Society Centenary Symposium on Fungal Biodiversity, Sheffield, England, April 11, 1996.
Invited speaker, Fungal Biodiversity, Thailand, 1998.

Offices and Committee Assignments Held in Professional & Honorary Societies

Agricultural Research Service
RPES Advisory Committee, Member and Chair, 1993-1997
RPES, Panel Chair, 1995-present
Beltsville Symposium XXI, Chair, 1996
American Institute of Biological Sciences
Board of Directors, Member, 1995-present
Association of Systematics Collections
Secretary, 1993-1996
Editor, *ASC Newsletter*, 1987-1990
Mycological Society of America
President and associated positions, 1995-1996
Chairperson, Committee on Culture Collections, 1987-1988
Representative to the Association of Systematics Collections, 1988-present
Treasurer, 1983-1986
American Type Culture Collection

Board of Directors, Member, Vice-Chair, 1990-1996
International Union of Microbiological Sciences
Member, International Commission on the Taxonomy of Fungi, 1987-present
Editorial Board, *Memoirs of the New York Botanical Garden*, 1987-1991
Editorial Board, *Mycotaxon*, 1990-present

Collaborators

Gerald Bills, Merck Research Laboratories, Rahway, NJ
Lois Brako, University of Missouri, St. Louis
Richard Bruce, Highlands Biological Station, Highlands, NC
Frank Dugan, American Type Culture Collection, Rockville, MD
Roger Goos, University of Rhode Island, Kingston, RI
David Hawksworth, International Mycological Institute, Egham, Surrey, United Kingdom
Elaine Hoagland, Association of Systematics Collections, Washington, D.C.
Daniel Janzen, University of Pennsylvania, Philadelphia, PA
S.C. Jong, American Type Culture Collection, Rockville, MD
James Lawrey, George Mason University, Fairfax, VA
Douglass Miller, USDA-ARS, SEL, Beltsville, MD
Jean Ristaino, North Carolina State University, Raleigh, NC
Timothy Schubert, Plant Industry Station, Florida State Agriculture
Nancy J. Taylor, Ohio State University, Columbus, OH
Rodham Tulloss, retired, Bell Laboratories, Roosevelt, NJ

Publications (1995-April, 1997)

Miller, D. and A. Y. Rossman. 1995. Systematics, biodiversity, and agriculture: a crucial interaction. *Bioscience* 45: 680-686.

Brako, L., A. Y. Rossman, and D. F. Farr. 1995. *Scientific and Common Names of 7,000 Vascular Plants in the United States.* American Phytopathological Society, St. Paul, MN. 295 pp.

Rossman, A.Y. and D. Miller. 1996. Systematics solves problems in agriculture and forestry. *Annals Missouri Bot. Garden* 83: 17-28.

Rossman, A.Y. 1996. Morphological and molecular perspectives on systematics of the Hypocreales. *Mycologia* 88: 1-19.

Rossman, A.Y. 1996. The evolution of fungal diversity: past, present and future. pp. 33-39. In: Colwell, R.R., et al., eds. *Microbial Diversity in Time and Space*. Plenum Publ., New York.

Courtecuise, R., G.J. Samuels, M. Hoff, A.Y. Rossman, G. Cremers, S. M. Huhndorf, and S.L. Stephenson. 1996. Checklist of fungi from French Guiana. *Mycotaxon* 57:1-85.

Farr, D.F. and A.Y. Rossman. 1997. Integration of data for biodiversity initiatives. pp. 475-490. In: Reaka, et al., eds. *Biodiversity II: Understanding and Protecting our Natural Resources.* Joseph Henry Press, Washington, D.C.

Miller, D.R. and A.Y. Rossman. 1997. Biodiversity and systematics: their application to agriculture. pp. 217-230. In: Reaka, et al., eds. *Biodiversity II: Understanding and Protecting our Natural Resources.* Joseph Henry Press, Washington, D.C.

Hoagland, K. E. and A. Y. Rossman, eds. 1997. *Global Genetic Resources: Access, Ownership and Intellectual Property Rights.* Association of Systematics Collections, Washington, DC. 358 pp.

Rossman, A.Y. 1997. The use of fungi in biological control. pp. 91-101. In: Hoagland, K. E. and A. Y. Rossman, eds. *Global Genetic Resources: Access, Ownership and Intellectual Property Rights.* Association of Systematics Collections, Washington, DC.

Shands, H. and A.Y. Rossman. 1997. Perspectives on Global Genetic Resources: Access, Ownership and Intellectual Property Rights. pp. 355-361. In: Hoagland, K. E. and A. Y. Rossman, eds. *Global Genetic Resources: Access, Ownership and Intellectual Property Rights.* Association of Systematics Collections, Washington, DC.

Rossman, A.Y. and D. F. Farr. 1997. Towards a virtual reality for plant-associated fungi in the United States and Canada. *Biodiversity and Conservation* 6: (in press).

Rossman, A. Y. and N. J. Taylor. 1997. First report of *Nematostoma artemisiae* on *Artemisia* in the United States. *Plant Disease* 81:accepted 14 February 1997.

Hawksworth, D.H. and A.Y. Rossman. 1997. Where are all the undescribed fungi? *Phytopathology* 87: (in press).

Rossman, A.Y., R.E. Tulloss, G. Bills, et al. 1997. *Protocols for an Inventory of Fungi in a Costa Rican Conservation Area.* Parkway Publishers, Boone, NC. 164 pp. (in press)

Rossman, A.Y. and J.L. Maas. 1997. Sphaeronemella fruit rot. (in press). IN: Maas, J.L. (ed.) *Compendium of Strawberry Diseases.* American Phytopathological Society, St. Paul, MN.

Rossman, A.Y. and G.J. Samuels. 1997. Proposal to conserve the names Nectriopsis 1911 against *Chrysogluten* 1904, *Dasyphthora* 1909, and *Dimerosporiella* 1908 (Hypocreales). *Taxon*:in pre-submission review.

Non peer-reviewed:

Rossman, A. Y. 1997. Biodiversity of Tropical Microfungi: An Overview. p. 1-10. In: Hyde, K. D., ed. *Biodiversity of Tropical Microfungi*. Hong Kong University Press, Hong Kong.

Rossman, A.Y. 1995. Microfungi: molds, mildews, rusts and smuts. pp. 190-192. In: *Our Living Resources. A Report to the Nation on the Distribution, Abundance, and Health of U.S. Plants, Animals, and Ecosystem*. U.S. Dept. Interior, Washington, D.C..

Rossman, A. Y. 1996. Beltsville Symposium XXI on Global Genetic Resources: Access, Ownership and Intellectual Property Rights. *Environmental Conservation* 23: 276-277.

Rossman, A.Y. 1997. *U.S. National Fungus Collections.* Submitted to ARS Information Staff for final editing.

Rossman, A.Y. 1997. Book review of: *Fungi and Environmental Change* by J.C. Frankland, N. Magan and G.M. Gadd (eds.). *Bioscience*: in presubmission review.

I. **GARY J. SAMUELS**
Research Botanist (Mycologist)

II. **Research Progress and Plans**

CRIS Project: 1275-22000-105-00D (1.0 FTE)
Systematics of Fungi Important in Biological Control: *Hypocrea* and its anamorphs, *Gliocladium* and *Trichoderma*

Objectives

Develop a taxonomy of *Trichoderma* and *Gliocladium* including a circumscription of the genera and a modern key to species of *Trichoderma* with emphasis on conidial states of Hypocrea species. Define the genetics of sexuality of *Hypocrea* and *Trichoderma*. Provide a monographic account for species of *Hypocrea* in North America and the American tropics. Provide a monographic account of Nectria and other pyrenomycetes.

Progress

* Morphological, and DNA analyses demonstrated that *Gliocladium virens*, an important biological control species, is actually a species of *Trichoderma*. It behaves exactly like *Hypocrea* and other *Trichoderma* species in DNA analysis and unlike typical *Gliocladium*. *Hypocrea schweinitzii*, previously thought to be cosmopolitan, was shown by morphometric and isozyme analysis to fall into geographically defined taxonomic entities. *Trichoderma reesei*, a standard for cellulase production, is theorized to have been derived from a tropical population of *H. jecorina*. A model was proposed to explain the seemingly endless number of species in agriculturally important genera such as *Trichoderma* and Fusarium through the evolution of clonal lines from sexual populations. Morphologically and genetically similar species of *Hypocrea* have been collected in North America and Taiwan. Initial rDNA analysis supported the genetic distinctness of *Trichoderma viride* Meyer groups I and II, that were based on mtDNA and conidial ornamentation.

* *Hypocrea jecorina*, possible teleomorph of *T. reesei*, was induced to undergo sexual reproduction in the laboratory. Sexual compatibility is determined by a bipolar mating system. *Hypocrea poronioidea*, with an unnamed *Trichoderma* anamorph, was also induced to reproduce sexually in vitro. Genetics of sex in *H. poronioidea* is not straight forward. Half the progeny of meiosis are self fertile while half remain sexually incompetent, leading to the suggestion that in these species each meiosis has the potential of forming eight clonal, genetically distinct, biological species of *Trichoderma*.

* Over 200 collections have been made in eastern North America. Most have been grown in pure culture. Approximately one-third of the cultures have been studied. One new species has been described with a synnematous anamorph. A *Hypocrea* teleomorph has been found in Illinois

for *T. koningii*. Cultures have been distributed to molecular labs for American *Hypocrea* just as they were for tropical *Hypocrea.*

* Many Hypocrea specimens collected in Brazil, French Guiana, Guyana. Puerto Rico, and Venezuela have been grown in pure culture. Most of the available type specimens of *Hypocrea* species reported from the American tropics have been studied. *H. poronioidea*, *H. brevipes* and a new *Hypocrea* species and their *Trichoderma* anamorphs have been described.

* Many specimens of *Nectria* have been collected and grown in pure culture. All available types from the American tropics have been studied. A preliminary key to species has been prepared. The new family *Helminthosphaeriaceae* (Sordariales) has been proposed and monographed. The family *Niessliaceae* (Hypocreales) has been monographed (exclusive of the genus *Niesslia,* for which work is underway).

Plans

* All of the following plans are part of an ongoing international collaboration that involves several labs in Britain, Austria, Germany, Denmark, Switzerland and The Netherlands. A key and descriptions for the *Hypocrea* and *Trichoderma* in *Trichoderma* sect. Longibrachiatum is being prepared. A taxonomic study of *T. harzianum* is underway. This species is often cited in biological control and recently found to be a serious problem in commercial mushroom production. *Trichoderma koningii* will neotypified and characterized vis á vis morphologically similar but genetically distinct *Hypocrea* species. A study of *T. aureoviride* and similar species of *Hypocrea* is underway.

* Study of tropical *Hypocrea* and their *Trichoderma* anamorphs will continue by completing the examination of type specimens of *Hypocrea* species described from tropical regions. The *Hypocrea* collections have been divided into groups based upon their anamorphs. Those that have anamorphs belonging to *T. harzianum*, *T. hamatum*, *T. aureoviride*, *T. koningii* and *T. polysporum* have been distributed to molecular laboratories for characterization. Based on those and additional collections and cultures, modern descriptions of those species including both the sexual and asexual states will be completed by the end of FY 1999.

* Collecting will continue in the United States followed by study of all cultures and collections. The short term plan is to characterize *Hypocrea* species that have *Trichoderma* anamorphs comparable to *T. harzianum*, *T. hamatum*, *T. aureoviride*, *T. koningii* and *T. polysporum.* The long term aim is a monographic treatment of *Hypocrea* and their *Trichoderma* anamorphs in North America. Type specimens will be studied of all species of *Hypocrea* described from North America as well as from Europe.

* Work is progressing emphasizing the species that have *Cylindrocarpon* and *Fusarium* anamorphs. Collaboration with an European student is planned on a monograph of Bionectria and its anamorph (*Clonostachys* = *Gliocladium roseum*). Collaboration with a French mycologist is planned on the recognition of new genera of pyrenomycetes.

III. Curriculum Vitae

Education

Ph.D. 1971 Columbia University
Major: Mycology
M.A. 1968 Columbia University
Major: Mycology
B.Sc. 1966 Pennsylvania State University
Major: Botany.

Employment History

1989 - Present Research Botanist, Systematic Botany and Mycology Laboratory, USDA-ARS, Beltsville, MD.

March, 1995 - present, Adjunct Professor, Department of Plant Pathology, Pennsylvania State University, University Park, PA

1985 - 1989 Research Associate, The New York Botanical Garden, Bronx, NY.

1973 - 1985 Scientist (Mycologist), Plant Diseases Division, Dept. of Scientific and Industrial Research, Auckland, New Zealand.

1971 - 1973 NIH Postdoctoral Fellow, The New York Botanical Garden, Bronx, NY.

Professional Recognition

Honors and Awards

Gertrude Burlingham Scholar at the New York Botanical Garden, 1968, 1970.
Scientific Guest Researcher, Eidg. Technische Hochschule, Institut fur Spezielle Botanik, Zurich, 1978.
National Science Foundation Grant BSR 8500236, "Floristic Monograph of the Hypocreales for the Neotropics," 1985-1988, $175,000.
National Science Foundation grant BSR 87-21877, "Floristic monograph of Hypocrea and its r elatives (Ascomycetes, Hypocreales) in the American tropics," 1988-1990, $120,000.
National Science Foundation Grant BSR-89145654 "Endophytes of the tropical palm Euterpe oleracea." Dissertation improvement grant with Katia F. Rodrigues as SI, $8,000. 1988.
National Biological Control Institute, Facilitation Grant Program (with R.L. Lumsden). Fifth International Trichoderma/Gliocladium Workshop. $5311. 1995.

Special Invitations

Second Kananaskas conference on taxonomy of fungi imperfecti, Kananaskas, Canada. "Conidia and Classification of the nectrioid fungi" (with A.Y. Rossman), 1979.

Third International Mycological Congress, Tokyo. 1983. "Toxigenic fungi as ascomycetes" in the symposium: Taxonomy of mycotoxin-producing fungi; "Kinds of pleomorphism in the Hypocreales" in the symposium: Pleomorphic fungi: the diversity and its taxonomic implications.

Fifth International Fusarium Workshop, Sydney. 1983. *"Microdochium stoveri* and *Monographella stoveri*, new combinations for *Fusarium stoveri* and *Micronectriella stoveri*" (with I.C. Hallett).

Fourteenth International Botanical Congress, Berlin. 1987. "The conidiogenous cell and taxonomy of non lichenized ascomycetes" in the symposium: Systematics of non lichenized ascomycetes.

Annual Meeting of the American Phytopathological Society, San Diego. 1988. "The relation of *Trichoderma* to the systematics of *Hypocrea"* in the discussion session: Recent advances in the systematics of the genus *Trichoderma*.

Fourth International Mycological Congress, Regensburg, Federal Republic of Germany. 1990. "Observations on New Zealand's mycobiota "and "Fungicolous Hypocreales" (with R. Lowen & C.T. Rogerson). Organizer: Symposium on Tropical Mycology.

International Symposium on Taxonomy and Biology of the Ophiostomatales, Bad Windesheim, Federal Republic of Germany. 1990. "The case for distinguishing *Ophiostoma* and *Ceratocystis*."

Fifth International Mycological Congress, Vancouver, British Columbia, Canada, 1994. Molecular systematics of the Hypocreales. Teleomorph gene phylogenies and the status of orphan anamorphs" (with S.A. Rehner) (in the Congress Symposium, "Systematics of the Ascomycota"). "*Gliocladium*, a model of genus under multidisciplinary investigation" (with W. Gams, H.J. Schroers, K.A. Seifert) (in the Contributed Symposium, "Integrated systematics of Deuteromycetes"). Co-organizer (with G. Harman): Contributed symposium "Molecular Biology of *Trichoderma"*. "Kinds of pleomorphism in the Hypocreales" in the symposium: Pleomorphic fungi: the diversity and its taxonomic implications.

Offices and Committee Asignments Held in Professional and Honorary Societies

Mycological Society of America
Member, Chair, Culture Collection Committee, 1989 - 1993.
Member, Nomenclature Committee, 1993.

Associate Editor, Member, Editorial Board, *Mycologia*, 1990 - present.

Member, Editorial Board, *Sydowia*, 1990 - present.

Member, International Commission for Taxonomy of Fungi (ICTF), 1990 - present.
Fusarium and *Trichoderma* subcommittees of the ICTF, 1990 - present.
Nomenclature Committee for Lichens and Fungi, 1992 - present.

Collaborators

Margaret Barr, Sydney, British Columbia
David Brayford, International Mycological Institute, United Kingdom
John Bissett, Agriculture Canada, Ottawa, Ontario
Walter Gams, Centraalbureau voor Schimmelcultures, The Netherlands
Evangeline Gueho, Institute Pasteur, Paris, France
Sabine Huhndorf, Field Museum of Natural History, Chicago, IL
Christian Kubicek, Federal Technical University, Vienna, Austria
Elke Lieckfeldt, Humboldt University, Berlin
D. Jean Lodge, U.S. Forest Service, Forest Products Laboratory, Puerto Rico
Rosalind Lowen, New York Botanical Garden, Bronx, NY
S. Muthumeenakshi, Horticult. Res. Internat., Wellesbourne, UK
Helgard Nirenberg, Biologische Bundesantalt, Berlin
Orlando Petrini, Comano, Switzerland
Kadri Põldmaa, Institute of Zoology and Botany, Tartu, Estonia
Katia Rodrigues, Insituto Oswaldo Cruz, Rio de Janeiro, Brazil
Jack D. Rogers, Washington State University, Pullman, WA
Clark T. Rogerson, New York Botanical Garden, Bronx, NY
Helen Rolph, International Mycological Institute, Egham, UK
Keith Seifert, Agriculture Canada, Ottawa, Ontario
Dianna A. Sutton, The University of Texas, San Antonio
Ulf Thrane, Dept. of Biotechnology, Tech. Univ. Lyngby, Denmark

Publications (1995-April, 1997)

Rehner, S. A., and G. J. Samuels. 1995. Molecular systematics of the Hypocreales: a teleomorph gene phylogeny and the status of their anamorphs. *Canad. J. Bot.* 73 (Suppl. 1): S816-S823.

Samuels, G. J., and K. A. Seifert. 1995. The impact of molecular characters on systematics of filamentous ascomycetes. *Annu. Rev. Phytopathology* 33: 37-67.

Kuhls, K., E. Lieckfeldt, G. J. Samuels, W. Kovacs, W. Meyer, O. Petrini, W. Gams, T. Börner, and C.P. Kubicek. 1996. Molecular evidence that the asexual industrial fungus *Trichoderma* reesei is a clonal derivative of the ascomycete *Hypocrea jecorina*. *Proc. Nat. Acad. Sci. USA* 93: 7755-7760.

Samuels, G. J. and F. Candoussau. 1996. *Calosphaeria fagi* sp. nov., and its *Ramichloridium* and *Sporothrix* synanamorphs. *Nova Hedwigia* 62: 47-60.

Samuels, G. J. and D. J. Lodge. 1996. Three species of *Hypocrea* with stipitate stromata and *Trichoderma* anamorphs. *Mycologia* 88: 302-315.

Leuchtmann, A., Petrini, O. and Samuels, G.J. 1996. Isozyme subgroups in *Trichoderma* section *Longibrachiatum*. *Mycologia* 88: 384-394.

Samuels, G.J. 1996. *Trichoderma*: a review of biology and systematics of the genus. *Mycol. Res.* 100: 923-935.

Samuels, G.J. and D.J. Lodge. 1996. Three species of *Hypocrea* with stipitate stromata and *Trichoderma* anamorphs. *Mycologia* 88: 302-315.

Kubicek, C., U.M. Bölzbauer, W. Kovacs, R.L. Mach, K. Kuhls, E. Leickfeldt, T. Börner, and G.J. Samuels. 1996. Cellulase production by species of *Trichoderma* sect. *Longibrachiatum* and of *Hypocrea* species with anamorphs referable to *Trichoderma* sect. *Longibrachiatum Fungal Genetics and Biology* 20: 105-114.

Courtecuise, R., G.J. Samuels, M. Hoff, A.Y. Rossman, and G. Cremers. 1996. Check-list of fungi from French Guiana. *Mycotaxon* 57: 1-85.

Lodge, D.J., I. Chapela, G.J. Samuels, et al. 1996. A survey of patterns of diversity in non-lichenized fungi. *Mitt. Edigenöss. Forsch. anst. Wald Schnee Landsch.* 70: 157-173.

Rogerson, C.T. and G.J. Samuels. 1996. Mycology at The New York Botanical Garden (1895 - 1995). *Brittonia* 48: 389-398.

Samuels, G.J. 1996. Tropical Hypocreales. pp. 293-321. In K.D. Hyde, ed. *Diversity of Tropical Microfungi.* University of Hong Kong Press, Hong Kong.

Samuels, G.J., and D.J. Lodge. 1996 (1997). *Rogersonia*, a new genus of the Hypocreales. *Sydowia* 48: 250-254.

Samuels, G.J., F. Candoussau, and J.-F. Magni. 1997. Fungicolous pyrenomycetes 1. *Helminthosphaeria* and the new family Helminthosphaeriaceae. *Mycologia* 89: 141-155.

Samuels, G.J., F. Candoussau, and J.-F. Magni. 1997. Fungicolous pyrenomycetes 2. *Ascocodinaea*, gen nov. and reconsideration of *Litschaueria*. *Mycologia* 89: 156-162.

Seifert, K.A., and G.J. Samuels. 1997. Two new hypocrealean fungi with synnematous anamorphs. *Mycologia* 89: 512-520.

Turner, D., W. Kovacs, K. Kuhls, E. Lieckfeldt, B. Peter, I. Arisan-Atac, J. Strauss, G.J. Samuels, T. Börner, C. P. Kubicek. 1997. Biogeography and phenotypic variation in *Trichoderma* sect. *Longibrachiatum*. *Mycol. Res.* 101: 449-459.

Kuhls, K., E. Lieckfeldt, G.J. Samuels, T. Börner, W. Meyer, and C.P. Kubicek. 1997. Revision of *Trichoderma* sect. *Longibrachiatum* including related teleomorphs based on analysis of ribosomal DNA internal transcribed spacer sequences. *Mycologia* 89: (in press).

Põldmaa, K., and G.J. Samuels. 1997. Three new polyporicolous species of *Hypomyces* and their *Cladobotryum* anamorphs. *Sydowia* 49: (in press).

Hywel-Jones, N.L., and G.J. Samuels. Three species of *Hypocrella* with large stromata pathogenic on scale-insects. *Mycologia* (submitted Sept. 1996).

Samuels, G.J., M.E. Barr. Notes on and additions to the Niessliaceae (Hypocreales). *Canad. J. Bot.* (submitted Feb. 1997).

I. **JOHN H. WIERSEMA**
Nomenclatural Botanist (Category 4 SY)

II. **Progress and Plans**

CRIS Project: 1275-21000-069-00D
Systematics of Vascular Plants Important to Agriculture

Objective

Publish a comprehensive reference resource on the scientific names of vascular plants important in national and international agriculture. Develop GRIN as an international standard source of nomenclature for economic plants. Respond to the daily vascular plant taxonomic and nomenclatural needs of the Agricultural Research Service, especially the National Plant Germplasm System (NPGS) and its GRIN database. Determine the correct scientific nomenclature for economically important species of the Rosaceae.

Progress

* Over 10,000 names are to be included in this comprehensive reference on economic plants important in domestic and international commerce and regulation. For each name, the accepted nomenclature has been determined by consulting the taxonomic literature, including monographs, revisions, floras, or other articles. Correct authorship and orthography was verified by consulting original references when necessary. All nomenclature was evaluated according to the International Code of Botanical Nomenclature. Reports for specific taxonomic groups have been printed and sent to ca. 250 taxonomic specialists. About 2/3 of the reviews have now been returned. Four major publishers have expressed interest in publishing this work. On-line access to all project data via the GRIN Taxonomy World-Wide-Web site is now available.

* A World-Wide-Web interface for GRIN taxonomic data has been developed enabling users from throughout the world to access this information easily and efficiently. GRIN taxonomic data can now be queried by scientific name (family, genus, or species), common name, economic uses, or distribution. Specialized searches on GRIN data relating to economic plants, rare plants, noxious weeds, families and genera, or seed associations are also possible. In 1996 and 1997, an average of about 2,000 per month were made using the Taxonomy Web pages. For the same period, all taxonomy data from an average of ca. 6,000 taxa a month was examined during these and other accession-based searches.

* Email requests for taxonomic information are received almost daily, i.e., 179 counted during 1996, many of which arise from NPGS Repositories or elsewhere within ARS or USDA. They are acknowledged and responded to as quickly as possibly with data added to the GRIN taxonomic system.

* Work on several comprehensive lists of plant names is ongoing and includes: a) a review of 3,000+ scientific names from the USDA-Natural Resources Conservation Service, b) updating almost 3,000 scientific names from the International Seed Testing Association's List of Stabilized Names, c) a review of 200 pages of scientific and common names for a world checklist of poisonous plants, and d) a review of about 900 scientific and 3,800 common names for the second edition of the *Food and Feed Crops of the United States*.

* Nomenclatural, distributional, and bibliographic data and common names for the 2,700 members of Rosaceae in GRIN have been incorporated into GRIN. Data on common names and economic uses for the 286 Rosaceae names will be included in the publication on economic plants.

Plans

* Work will continue on evaluating and incorporating the comments of reviewers into the GRIN database including further interaction with some reviewers to resolve taxonomic or nomenclatural questions. Enhancements to the data, such as expanding distribution data and common name data will improve its value to users. An introduction will be written. Publishing arrangements will be finalized and the entire manuscript submitted early in 1998. The final publication is anticipated to be 800-1000 pp.

* Work on the remaining unverified names in GRIN. Incorporate information from new literature for those names previously revised. Continue to respond in a timely manner to all nomenclatural inquiries originating within NPGS. It is hoped that work on the larger lists can be completed by the end of 1997.

* In collaboration with the personnel at GRIN, improvements to the GRIN Taxonomy Web access are planned to provide better reporting of data and additional linking to other databases from GRIN taxonomy.

* The remaining scientific names of *Rosaceae* in GRIN will be reviewed to determine their taxonomic status and to collect additional information as for other plants. It is anticipated that a comprehensive account of scientific names in the *Rosaceae* will be completed in three-four years.

III. Curriculum Vitae

Education

Ph.D. 1984	University of Alabama
	Major: Botany
M.S. 1979	University of Alabama
	Major: Biology
B.S. 1974	Western Michigan University
	Major: Psychology & Sociology

Employment History

1989 - present Nomenclatural Botanist, Systematic Botany and Mycology Laboratory, USDA/ARS

1984 - 1989 Research Associate, Cooperative Agreement between USDA-ARS and University of Maryland. Provided nomenclatural expertise to National Plant Germplasm System and Germplasm Resources Information Network.

Professional Recognition

Awards and Grants

Jesse M. Greenman Award from Missouri Botanical Garden for paper judged best in vascular plant or bryophyte systematics based on a doctoral dissertation and published during the previous year, 1988.
Outstanding dissertation, College of Arts and Sciences, University of Alabama, 1985.
National Science Foundation grant for doctoral research (No. DEB 8111024, Robert R. Haynes, PI).

Special Invitations

Invited speaker, Nomenclature. Symposium on Agricultural Research Service, 67th Annual Society of Commercial Seed Technologists Meeting, Annapolis, MD, 1990
Invited speaker, Report on AOSA Handbook 25, Uniform Classification. Northeast Seed Analysts Workshop, Beltsville, MD. 1991.

Offices and Committee Assignments Held in Professional and Honorary Societies

Member, Editorial Board, Genetic Resources and Crop Evolution.
Member, In-Depth Review Team, Research Unit, U.S. National Arboretum, USDA/ARS, May, 1991.

Collaborators

Vickie N. Binstock, National Germplasm Resources Laboratory, Beltsville, MD
Edward M. Bird, National Germplasm Resources Laboratory, Beltsville, MD
C. Barre Hellquist, North Adams State College, North Adams, MA
Steven Hill, Illinois Natural History Survey, Urbana, IL
Charles N. Horn, Newberry College, Newberry, SC
Michael Jeffe, Silver Spring, MD
Arnold Larsen, Colorado State Seed Laboratory, Ft. Collins, CO
Blanca León, University of Maryland, College Park, MD
George M. Markle, Rutgers University, New Brunswick, NJ

Alejandro Novelo R., Instituto de Biologia, UNAM, Mexico City, Mexico
Scott Peterson, USDA-NRCS, Baton Rouge, LA
Carole Ritchie, Laurel, MD
D. Jesse Wagstaff, U.S. Food and Drug Administration, Bethesda, MD

Publications (1995 - April, 1997)

Wiersema, J. H. 1995. Taxonomic information on cultivated plants in the USDA/ARS Germplasm Resources Information Network (GRIN). Proceedings of the Second International Symposium on the Taxonomy of Cultivated Plants, August 1994. *Acta Horticulturae* 413:109-115.

Wiersema, J. H. 1996. *Nymphaea tetragona* and *Nymphaea leibergii* (Nymphaeaceae): two species of diminutive water-lilies in North America. *Brittonia* 48(4):520-531.

Kirkbride, J. H., Jr. and J. H. Wiersema. 1997. *Bobgunnia*, a new African genus of tribe Swartzieae (Fabaceae, Faboideae). Brittonia 49(1):1-23.

Wiersema, J. H. 1997. 13. Cabombaceae A. Richard: water-shield family. In FNA Editorial Committee, (ed.), *Flora of North America north of Mexico* 3:78-80.

Wiersema, J. H. 1997. 11. Nelumbonaceae Dumortier: lotus-lily family. In FNA Editorial Committee, (ed.), *Flora of North America north of Mexico* 3:64-65.

Wiersema, J. H., and C. B. Hellquist. 1997. 12. Nymphaeaceae Salisbury: water-lily family. In FNA Editorial Committee, (ed.), *Flora of North America north of Mexico* 3:66-77.

I. **LISA A. CASTLEBURY**
Research Associate - Research Botanist (Mycologist)
(Started January 6, 1997)

II. CRIS Project: 1275-22000-022-00D
Systematics of Plant Pathogenic Fungi Important to Agriculture

Objectives

Morphometric characterization of *Tilletia indica* and morphologically similar species of *Tilletia* and development of a database of teliospore images.

Progress

* The bunt fungi, *Tilletia indica*, *T. horrida*, and a similar, apparently undescribed *Tilletia* from *Lolium* spp., have been characterized based on their teliospores using an image analysis system on a high-quality compound microscope. The morphology of teliospores of these fungi at various stages of maturity are being characterized.

* Using the in-house scanning electron microscope facility, Dr. Castlebury has been able to distinguish *T. indica* from a lookalike species of *Tilletia* that produced false positives for *T. indica* using a previously developed molecular technique. It is now possible to distinguish based on morphological features *T. indica* from *T. horrida* and the undescribed *Tilletia* from *Lolium* spp. in most cases. The ability to distinguish these species will allow those in the field to make accurate identifications and those in the laboratory to develop accurate molecular probes.

Plans

* Characterization of these species of *Tilletia* and others in the U. S. National Fungus Collections will continue based on statistical analyses of teliospore measurements and image analysis of exospore ornamentation. It is anticipated that a statistical analysis of teliospore measurements from *Tilletia indica* and morphologically similar species will be completed by the end of CY 97.

* A database of images and descriptions of these species of *Tilletia* available through the WWW for rapid identification of these fungi by the end of FY 98.

III. Curriculum Vitae

Education

Ph.D. 1994	University of Illinois Major: Plant Pathology (emphasis in mycology)
M.S. 1991	Western Illinois University Major: Biology (emphasis in microbiology)

B.S. 1988 Western Illinois University
Major: Biology (emphasis in microbiology)

Employment History

1997 - present Research Botanist (Mycologist), Systematic Botany and Mycology Laboratory USDA ARS Beltsville, MD

1994 - 1997 Postdoctoral Fellow, National Center for Toxicological Research/FDA, Division of Microbiology

Collaborators

Mary E. Palm, USDA APHIS, Beltsville, MD
Lori Carris, Washington State University, Pullman, WA

Publications (1995-April, 1997)

Castlebury, L.A., J.L. Crane and S.M. Huhndorf. 1995. A new species of *Rhytidenglerula* from Everglades National Park, Florida. *Mycotaxon* 54:461-463.

Zhang, D. L., Y.Yang, L. A. Castlebury and C. E. Cerniglia. 1996. A high transformation efficiency fungal DNA isolation method. *FEMS Microbiological Letters* 145: 261-265.

Castlebury, L.A. and L.L. Domier. 1997. The small subunit ribosomal RNA genes from *Plasmodiophora brassicae* contain three group I introns. *Mycologia*: (in press).

Castlebury, L.A. and L.L. Domier. 1997. Small subunit ribosomal RNA gene phylogeny of *Plasmodiophora brassicae*. Mycologia: (in press).

Castlebury, L.A., L. A. Tanner and J.B. Sutherland. A rapid bacterial assay for the mycotoxin beauvericin. *Mycopathologia* (in prep.)

Castlebury, L. A., A.L. Henderson, J.B. Sutherland and C.E. Cerniglia. Effects of the mycotoxin beauvericin on strains of Gram-positive bacteria. *Mycopathologia* (in prep.)

I. **KAROL ELIAS**
Research Associate, North Carolina State University
(Started 10/1/95)

II. **Research Progress and Plans**

CRIS Project: 1275-22000-022-00D
Systematics of Plant Pathogenic Fungi Important to Agriculture

Objective

Determine systematic and genetic relationships among major formae speciales of *Fusarium oxysporum* from respective specific hosts and related members of the *Fusarium* complex using molecular, genetic and morphological approaches.

Progress

* Established a collection of more than 200 strains of *Fusarium oxysporum* f. sp. *erythroxyli* from all major coca-growing regions of Peru. Selected complementary nitrate-nitrogen metabolism mutants from all fungal strains, paired complementary mutants and assigned strains to vegetative compatibility groups. Determined the population structure of the *Fusarium oxysporum* f. sp. *erythroxyli* populations causing the present Fusarium Wilt epidemic in Peru and identified the origin of the pathogenic population present in Hawaii.

* Developed a reliable greenhouse bioassay protocol to unambiguously identify pathogenicity of *Fusarium oxysporum* isolates on coca. All strains isolated from *Eythroxylon* were tested for pathogencitiy and, based on this and other tests, strains were selected as *F. oxysporum* f. sp. *erythroxyli*.

* Member of planning committee and convener for the First International Fusarium Biocontrol Workshop, October 28 - 31, 1996, Beltsville, MD

Plans:

* Use RFLPs of specific genes amplified by PCR to examine 1) the relationships among genetically isolates populations of *Fusarium oxysporum* f. sp. *erythroxyli* and 2) the genetic relationships and systematics of form species of *Fusarium oxysporum* pathogenic on closely related plant host species. This work will be completed by the end of September, 1997.

* Use vegetative compatibility group analysis to determine the genetic relationships between systematic groupings of *Phomopsis* spp. based on DNA sequencing and examine the host range/form species relationships within *Phomopsis* spp.

* Use molecular and vegetative compatibility group analyses to determine the origin of Fusarium Wilt that has just appeared in Colombian coca-growing regions and this populations relationship to other isolated clonal populations within this formae speciales.

III. Curriculum Vitae

Education

Ph.D. 1989 Louisiana State University
Major: Plant Pathology

M.S. 1985 Michigan State University
Major: Plant Pathology

B.S. 1981 Purdue University
Major: Horticulture

Employment History

October, 1995 - present Research Associate, North Carolina State University, Collaborator, Systematic Botany and Mycology Laboratory, Beltsville, MD

1992 - 1995 Research Plant Pathologist (Postdoctoral), Southern Regional Research Center Agricultural Research Service, New Orleans, LA.

1989-1992 BARD Postdoctoral Fellow - United States - Israel Binational Agricultural Research and Development Fund, Department of Plant Pathology, A.R.O. - The Volcani, Bet-Dagan, Israel, and Department of Plant Pathology and Crop Physiology, Louisiana State University

Collaborators

Patricia Apel-Birkhold, USDA-ARS, Biocontrol of Plant Diseases Lab, Beltsville, MD
Peter Cotty, USDA-ARS, Commodity Safety Research Laboratory, New Orleans, LA
Javier Gracia-Garze, University of Guelph, Ontario
Corby Kistler, University of Florida, Gainsville
Ray Martyn, Texas A & M University, College Station, TX
Amy Nelson, United States Patent and Trademark Office, Crystal City, VA
T. N. Raju, International Crops Research Institute for the Semi-Arid Tropics, Andhra Pradésh, India

Publications

Elias, K. S., and P. J. Cotty. 1995. A Rose bengal-amended medium for selecting nitrate-metabolism mutants from recalcitrant fungi. Can. J. Bot. 73:680-682.

Elias, K. S., and P. J. Cotty. 1996. Incidence and stability of infection by double- stranded RNA genetic elements in *Aspergillus* section *flavi* and effects on aflatoxigenicity. Can. J. Bot. 74:716-725.

Elias, K. S. 1996. Use of a rose bengal amended chlorate medium to select nitrate-metabolism mutants from Phomopsis. Fungal Genetics Newsletter 43:71.

Elias, K. S. 1997. A fast and easy method to obtain pure cultures of *Fusarium oxysporum*. Fungal Genetics Newsletter 44: In press

Nelson, A. J., K. S. Elias, E. Arevalo, L. Darlington, and B. A. Bailey. 1997. Genetic characterization by RAPD analysis of isolates of *Fusarium oxysporum* f. sp. *erythroxyli* associated with an emerging epidemic in Peru. *Phytopathology* (in presubmission review).

I. **MARY EGDAHL PALM**
APHIS Staff Specialist (Mycologist)

II. **Progress and Plans**

As the mycologist for the Animal and Plant Health Inspection Service, Dr. Palm is the point person for the identification of fungi that occur on agricultural material entering the United States as well as fungi of plant-quarantine significance inside the U.S. She uses the reference resources at the U.S. National Fungus Collections and consults with the research mycologists on a daily basis. The Systematic Botany and Mycology Laboratory also provides support through the use of their facilities and support personnel.

III. **Curriculum Vitae**

Education

Ph.D. 1983 University of Minnesota
Major: Plant Pathology (emphasis in Mycology)
M.Sc. 1979 University of Minnesota
Major: Plant Pathology (emphasis in Mycology)
B.A. 1976 St. Olaf College, Northfield, MN
Major: Biology

Employment History

1984 - present Biological Assessment and Taxonomic Support Staff, USDA-APHIS, Beltsville, MD.

June, 1995 - present, Adjunct Associate Professor, Department of Plant Pathology, Pennsylvania State Univeristy, University Park, PA

1983 - 1984 Research Associate, University of Minnesota, Plant Pathology Department.

Professional Recognition

Special Invitations

Keynote speaker, 6th National Congress of Mycology, Tapachula, Mexico, 15-17 October 1997, "Systematics of Fungi: Emerging Diseases, Plant Quarantine, and Biodiversity."
Penn State Seminar Series, presented seminar on Karnal Bunt: A re-emerging disease, Sept 1997
American Phytopathological Society, APS Online Symposium on Karnal Bunt - invited paper presentation "Identification of Tilletia indica, cause of karnal bunt of wheat," June-Aug 1996

Keynote speaker at the 28th Brazilian Congress of Phytopathology, Ilheus, Bahia, Brazil, 21-25 August 1995, "Fungal Systematics: Modern Methods, Concepts, and Trends."

Offices and Committee Assignments Held in Professional and Honorary Societies

American Phytopathological Society
- Member, Regulatory Plant Pathology Committee, 1993-present.
- Member, Vice-Chair, Chair, Mycology Committee, 1985-89
- Organized and Moderated a colloquium entitled "Recent Molecular Approaches to the Systematics of Plant Pathogenic Fungi", APS meeting, Cincinnati OH, 1987

Mycological Society of America
- President, President-Elect, Vice-President, 1995-1998
- Secretary, 1991-94
- AIBS Rep. for Public Responsibility, 1994-1997
- Organized and moderated, with Dr. Ignacio Chapela, workshop entitled "Mycology in Sustainable Development: Expanding Concepts, Vanishing Borders." Partially funded by NSF and CONACyT
- Representative to AAAS, Subcommittee G - Biology, 1988-91
- Councilor, Taxonomy-Morphology, 1987-88
- Member, Foray Committee, 1986-89
- Chairperson, Committee on Publications in MSA, 1988-91

Latin American Mycological Association, U.S. Liaison for membership, 1994-present

American Type Culture Collection, Member, Mycology Advisory Board, 1996-present

International Association of Plant Taxonomy
- Member, Subcommittee C of Committee on Fungi and Lichens, 1986-88

Other Significant Information

Teaching Identification of the fungi causing Yellow Sigatoka and Black Sigatoka, Mayaguez, Puerto Rico, 28-30 April 1997

Instructor, National APHIS Identifiers Meeting - Plant Pathology - 4 May 1995

Co-organizer, International Workshop on Identification of Species and Groups of Alternaria, taught by Dr. Emory Simmons, 10-15 November, 1995, Pennsylvania State University Department of Plant Pathology.

Instructor/Coordinator, Taxonomy of Coelomycetes Workshop, Mycological Society of America, National Meeting, Toronto, August, 1989.

Instructor/Coordinator, Identification of Plant Pathogenic Fungi Training for USDA-APHIS Identifiers, BARC-West, Beltsville, MD, 22 June-1 July 1988

Instructor, Diagnosis and Identification of Plant Pathogens Workshop, American Type Culture Collection, Rockville, MD, 12 May 1987 Instructor, Identification of Plant Pathogenic Fungi - Training for USDA-APHIS Identifiers, USDA Professional Development Center, Frederick, MD, July, 1984.

Publications (1995 - April, 1997)

Palm, M. E., W. Gams, and H. Nirenberg. 1995. *Plectosporium*, a new genus for *Fusarium tabacinum*, anamorph of *Plectosphaerella cucumerina*. *Mycologia* 87: 397-406.

Palm, M. E. 1996. Fungal systematics, biodiversity and sustainable development. Rev. An. Patol. Plantas. 4: 245-260.

Palm, M.E. 1996. *Kirramyces phormii* comb. nov. on leaves of *Phormium*. *Mycol. Res.* 100: 373-376.

Ykema, R.E., J.P. Floyd, J.P., M.E. Palm. and G.L. Peterson. 1996. First report of karnal bunt of wheat in the United States. *Plant Dis.* 80: 1207.

Palm, M. E. and I. H. Chapela, eds. 1997. *Mycology in Sustainable Development: Expanding Concepts, Vanishing Borders.* Parkway Publ. Inc., Boone, North Carolina. 306 pp.

Weinstein, R. N., M. E. Palm, K. Johnstone, and D. D. Wynn-Williams. 1997. Ecological and physiological characterization of *Humicola marvinii*, a new psychrophilic fungus from fellfield soils in the maritime Antarctic. *Mycologia* 89: (in press).

Maas, J. and M. E. Palm. 1997. Occurrence of anthracnose irregular leafspot, caused by *Colletotrichum acutatum*, on strawberry in Maryland. *Adv. Strawberry Res.*: (in press).

Appendix 1. Persons/organizations visiting the U.S. National Fungus Collections and mycologists for information or identifications (1995-May, 1997):

Margaret Barr Bigelow, Sidney, British Columbia
Roger Blanco, INBio, San Jose, Costa Rica
J. Botha, ARS, PPRI, South Africa
Marcos Camara, Penn State, State College, PA
Camil Camargo, University of Pennsylvania, Philadelphia, PA
Guillermo Jiminez Chacon, InBio, San Jose, Costa Rica
Lori M. Carris, Washington State University, Pullman, WA
Barbara J. Christ, Pennsylvania State University, State College, PA
Pedro Crous, University of Stellenbosch, South Africa
Stephen Darbyshire, Agriculture Canada, Ottawa, Ontario, Canada
Stephanie Daughtery, Pennsylvania State University, State College, PA
Alonso M. Delgado INBio, San Jose, Costa Rica
Marai Mart Chavarria Diaz, ACG, Heredia, Costa Rica
Roger Flores, INBio, San Jose, Costa Rica
Walter Gams, Central Bureau, Schimmelculture, Baarn, Netherlands
Gabriela Heredia, Inst of Ecology, Mexico
Milagro Mata Hidalgo, INBio, San Jose, Costa Rica
B. Hudson, International Mycological Institute, Egham,UK
Ken Hudson, CABI, Wallingford, UK
Nigel Hywel-Jones, NCGEB, Bangkok, Thailand
Daniel Janzen, University of Pennsylvania, Philadelphia, PA
Peter Johnston, Landcare Institute, Wellington, New Zealand
Z. Jurjevic, Agriculture Faculty, Zegreb, Yugoslavia
Kristin Kehsins, FAO, Rome Italy
J. Kokasoshi, International Mycological Institute, UK
John Krug, Dept. of Botany, Univ. of Toronto, Toronto, Ontario, Canada
Peter R. Leacock, Plant Biology, Univ. of Minnesota, St. Paul, MN
Alendro Masis, INBio, San Jose, Costa Rica
Gene Milbrath, Oregon Dept of Agriculture, Salem, OR
Gregory Mueller, Field Museum, Chicago, IL
Mitch Nelson, APHIS, Seattle, WA
Stephen Ogden, MAF, Regulatory Authority, Wellington, New Zealand
B. Parry, University of Cambridge, United Kingdom
Ian Pasco, Agric. Victoria, Melbourne, Australia
K. Põldmaa, Inst. Of Zoology, Estonia
Jon Polishook , Merck Research Laboratory, Rahway, NJ
Betsy Randell-Schadel, North Carolina, Dept. of Agriculture, Raleigh, NC
Scott Redhead, Agriculture Canada, Ottawa, Ontario, Canada
Carlos Rodriguez, INBio, San Jose, Costa Rica
Emory Simmons, Crawfordsville, IN
Angel Solis, INBio, San Jose, Costa Rica

Juozar Staniulis, Inst. Of Botany, Vilnius, Lithuania
Tom Stebbins Tennessee Dept. of Agriculture, Knoxville, TN
Jeffrey Stone, Dept. of Botany and Plant Pathology, Orgeon State University, Corvallis, OR
Richard Summerbell, Ontario Ministry of Health, Univ. of Toronto, Toronto, Ontario, Canada
Michael Thom, Pennsylvania State University, State College, PA
Rodham Tullos, Roosvelt, NJ
Luz Romero Villolto, INBio, San Jose, Costa Rica
AlaneWend, CSIRO, Sydney, Australia
Nancy Wenner, Pennsylvania State University, State College
Nelson Zamora, INBio, San Jose, Costa Rica
Susan Will-Wolf, Botany Dept. University of Wisconsin, Madison, WI
Shiata A. Zekry, University, Egypt

Appendix 2. International and national institutions to which loans were made from the U.S. National Fungus Collections (BPI), 1995-April, 1997.

International:

Argentina:

Museo de La Plata, Inst. of Botany (3)
University of Buenos Aires, Dept. of Science & Biol (2)

Australia:

Biological & Chemical Res. Institute, Plant Path (4)
Queensland Dept. of Primary Industries (3)
Plant Research Institute (1)

Austria:

Karl Franzens University, Inst. of Botany (2)

Belgium:

State University of Gent, Laboratory of Plt. Systematics (3)

Brazil:

University of Brasilia, Dept. of Phytopathology (2)
University of Rio Grande del Sol, Dept. of Botany (2)

Bulgaria:

Bulgarian Academy of Sciences, Curator of Myc.Herbarium (1)

Canada:

Agric. Canada - Resources Res.,Center for Land and Biol. (4)
Agric. Canada - Center for Land & Biol. Nat'l Fungi Coll. (6)
University of Waterloo, Dept. of Biology (1)
Lakehead Univ., School of Forestry (1)
University of Alberta, Microfungi Coll. & Herbarium (1)
University of Toronto, Botany Dept. (1)

China:

Academia Sinica - Inst. of Microbiology (2)

Denmark:

University of Copenhagen - The Botanical Museum (3)

England:

International Mycological Institute (5)
Royal Botanic Garden, Keeper of Herbarium (1)

Finland:

Univ. of Helsinki - Botanical Museum (2)
Finnish Museum of Nat'l History Botanical Museum (1)
University of Oulu, Dept. of Botany (1)

Germany:

Martin Luther Univ., Inst. of Geobotany and Botanical Garden (1)
Natural Museum - Senckenberg (2)
Botanical Institute and Garden, Herbarium (1)
University of Freie - Berlin, Director (6)
Eberhard-Karls University, Inst. of Biology (2)
Biologische Bundensanstalt (1)
Museum of Berlin-Dahlem Herbarium (2)
Botanische Staatssemmlung, Curator (1)

Hong Kong:

University of Hong Kong, Dept. of Ecology & Biodiversity (4)
University of Hong Kong, Dept. of Botany (2)

Japan:

Forestry & Forest Products Inst. Wood Decay & Myc. Lab (2)
Hiroshima University - Botanical Inst., Faculty of Science (2)
Univ. of Tsukuba - Inst. of Agriculture & Forestry (3)
Nat'l Inst. of Agro-Biol. Research, Microbiol. Gene Bank (2)
Japan Collection of Microorganisms (1)

Netherlands:

Centralbureau for Schimmelcultures (3)
Plant Disease Service, Wageningen (1)

New Zealand:

Mt. Albert Res. Center, Herbarium (2)

Norway:

Univ. of Tromsoe, Botanical Dept. (1)
Univ. of Oslo, Dept. of Biology (1)

Rep. South Africa:

Plant Protection Res. Institute (3)
Univ. of Pretoria, Dept. of Botany (2)
Univ of Orange Free State, Dept. of Microbiology & Biochemistry (1)
Univ. of Stellenbosch, Dept. of Plant Pathology (2)

Spain:

Univ. of Barcelona, Curator of Herbarium (1)
Univ. of Alcala, Dir. of Herbarium (13)
Univ. of Alcala, Dept. of Biology (7)
Botanico Real Jardin, Curator of Cryptogram (8)

Sweden:

Univ. of Goteborg, Botanical Museum (3)
Botanical Museum, Herbarium (2)

Switzerland:

Swiss Federal Res. Station for Agronomy (1)
Univ. of Lausanne, Inst. of Botany and Systematics (1)

Thailand:

National Biological Control and Res. Center (1)

Venezuela:

Fondo Nat'l de Investigacions Agropecuarias, Dept of Phytopathology (1)

National:

AL
Auburn University, Plant Pathology (1)
Auburn University at Montgomery,Department of Biology (2)

AR
University of Arkansas,College of Agriculture. & Home Economics
Department of Plant Pathology (1)

AZ
The University of Arizona, Department of Plant Path. (3)

CA
San Francisco State Univ., Dept. of Biology (1)
California Dept. of Food & Agriculture, Division of Plant Industry, Analysis & Identification Branch (1)
USDA/Forest Service,Pacific Southwest Research Station (2)

CO
Dr. Annette W. Ramaley, Durango (1)

CT
Connecticut Agric. Expt. Stn. (3)

DC
Howard University, Department of Biology (1)

FL
University of Florida, Plant Pathology (1)

GA
The University of Georgia, Dept. of Plant Pathology (1)

ID
BLM-ID State Office (1)

IL
Field Museum of Nat'l History, Dept. of Botany (1)
USDA-ARS-NCAUR (1)
University of Illinois, Department of Botany (3)
University of Illinois, Urbana,Curator, Herbarium,Department of Plant Biology (1)
Southern Illinois University at Carbondale, Dept. of Plant. Biol. (1)

IN
Indiana University, Department of Biology (1)
Purdue University, The Arthur Herbarium (2)
Dr. Emory Simmons, Crawfordville (1)

IA
Iowa State University, Department of Plant Pathology (2)

KS
University of Kansas, Department of Botany (2)

MA
Harvard University, Farlow Herbarium (1)

MD
USDA,ARS, Foreign Disease-Weed Science Research,Fort Detrick (1)
USDA/ARS, National Program Staff (1)
USDA, ARS, (1)
Dr. Kishwar Nazir, Beltsville (1)

MI
Michigan State University College of Osteopathic Medicine,Department of Biomechanics (1)
Michigan State Univ., Director & Curator, Beal-Darlington Herbarium (3)
University of Michigan-Herbarium (1)

NC
North Carolina State Univ. (1)
Univ. of North Carolina,Institute of Marine Science (3)
North Carolina State Univ. (1)

ND
USDA/ARS,Northern Plains Area/NCSL (1)
North Dakota State University,Plant Pathology Department (1)

NJ
Merck Sharp & Dohme Laboratories (1)
Dr. Rodham E. Tulloss, Roosevelt (1)

NY
Cornell Univ., Plant Pathology Herbarium (3)

OR
Forestry Sciences Lab. (1)
Oregon State University, Dept. of Forest Science (1)

PA
Bloomsburg Univ. Dept. of Biology (1)

RI
The Univ. of Rhode Island, Botany Dept. (1)

SD
Black Hills State University (1)

TX
Texas College of Osteopathic Medicine Res. Office (1)

VA
George Mason Univ., Biology Dept. (1)
VPI&SU, Biology Dept. (1)

VT
Vermont Alternative Medicine (3)

WA
University of Washington, Dept. of Botany (1)
Washington State University, Dept. of Plant Pathology (9)

WI
USDA,Forest Service, Center for Forest Myc. Res. Forest Products Lab (7)

WV
Fairmont State College (1)

DEFINITIONS OF SOME TERMS, ABBREVIATIONS AND ACRONYMS USED IN ARS

ARS: Agricultural Research Service. An agency in Research Education, and Economics of USDA. ARS has about 8057 employees, including about 953 senior scientists. The Agency conducts research at 104 locations in the U.S. ARS is led by an Administrator and is divided geographically into eight Areas, which are led by Area Directors.

BA: The Beltsville Area includes the Beltsville Agricultural Research Center, the U.S. National Arboretum, and the Glenn Dale Plant Distribution Station. The Beltsville Area, at 6,600 acres, is the smallest Area geographically, but the largest in terms of personnel and budget. About 1567 employees, including about 462 scientists, work in the BA.

NPS: National Program Staff. Members are called National Program Leaders and each is a subject matter specialist. NPS serves the Administrator of ARS in developing and coordinating research plans and strategies on a national basis. NPS sets National program directions, establishes priorities, allocates resources, including this review, and acts as a clearing house for decision making. Considerable interaction between Area managers and NPS is required to fulfill our respective roles.

INSTITUTES/CENTERS: The Beltsville Agricultural Research Center is composed of five Institutes or Centers: the Plant Sciences Institute, the Livestock and Poultry Sciences Institute, the Natural Resources Institute, the Beltsville Human Nutrition Research Center, and the U.S. National Arboretum.

LABORATORIES: Laboratories are units located in the Institutes/Centers. Laboratories are led, both scientifically and administratively, by Research Leaders. Typically, a Laboratory is comprised of 8-10 scientists, a scientific and clerical support staff and several temporary student and postdoctoral employees. The program and mission of a Laboratory of this size must obviously be limited. In reviewing a Laboratory, bear in mind that what appear to be discipline or program gaps are often filled by collaboration with other Laboratories in the BA or elsewhere.

CRIS: Current Research Information System. This is an electronic system for the filing and retrieval of information about individual agricultural research projects. In ARS, the terms "CRIS Work Unit" or the acronym "CRIS" are used synonymously with "research project" or "project." New projects are planned in coordination with NPS and are subjected to peer-review. The normal life of a project in ARS is 3 to 5 years.

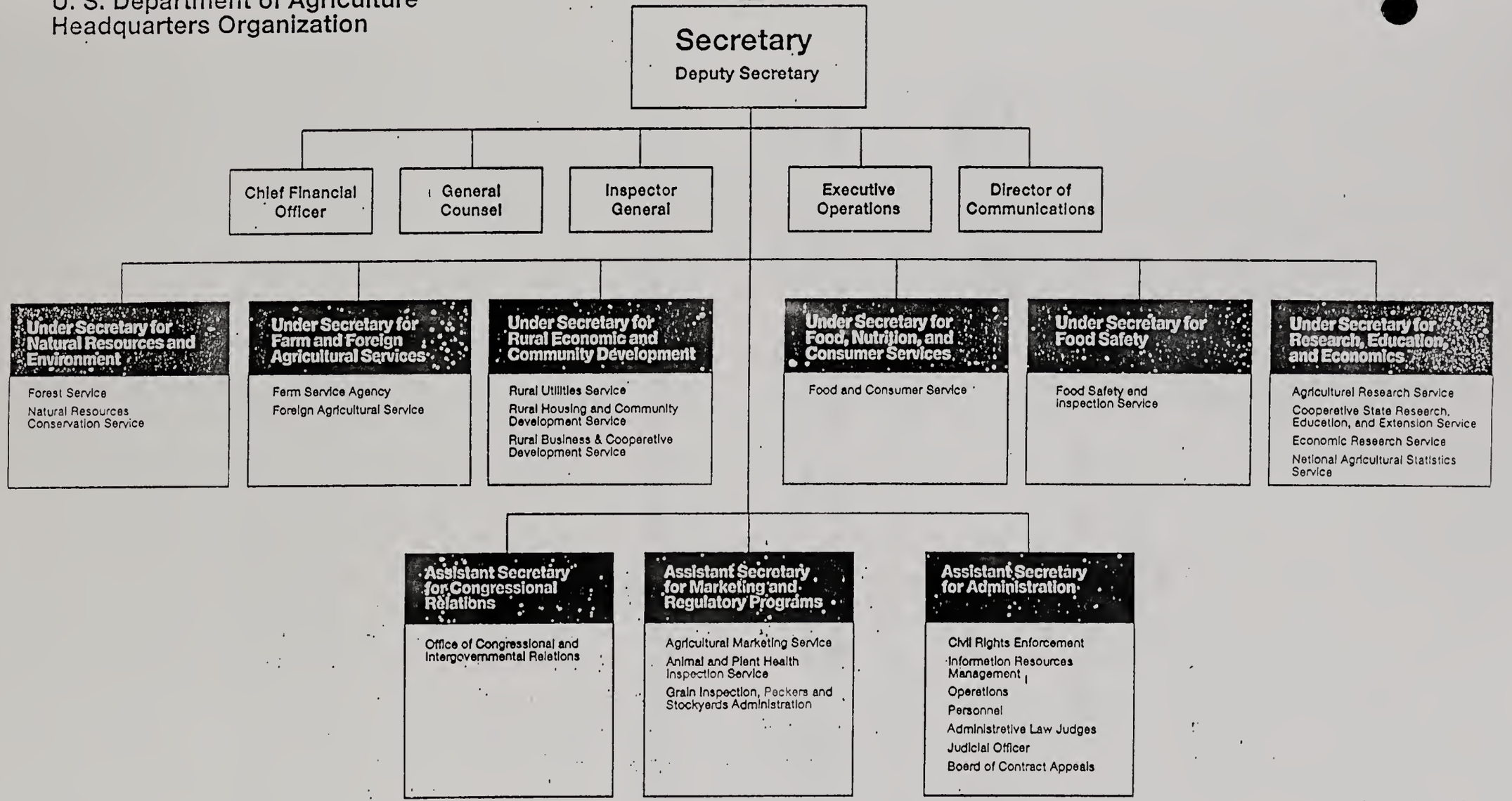
SY: Scientist Year. this is the effort of a research scientist for 1 year. Fractional efforts (e.g., 0.5 SY) in a given project are possible when a scientist works in more than one project during the course of a fiscal year. the term is also used in ARS as a synonym for a research scientist [e.g., "I have six SYs (research scientists) in my Laboratory"].

OTHER KINDS OF SCIENTIFIC PERSONNEL: Research scientists are responsible for all phases of research. ARS also employs research associates ("postdocs"), support scientists (who have responsibility for some portion of a project), technicians, students, and in some operations nonresearch scientific personnel who perform work involving service to the public or to other government agencies.

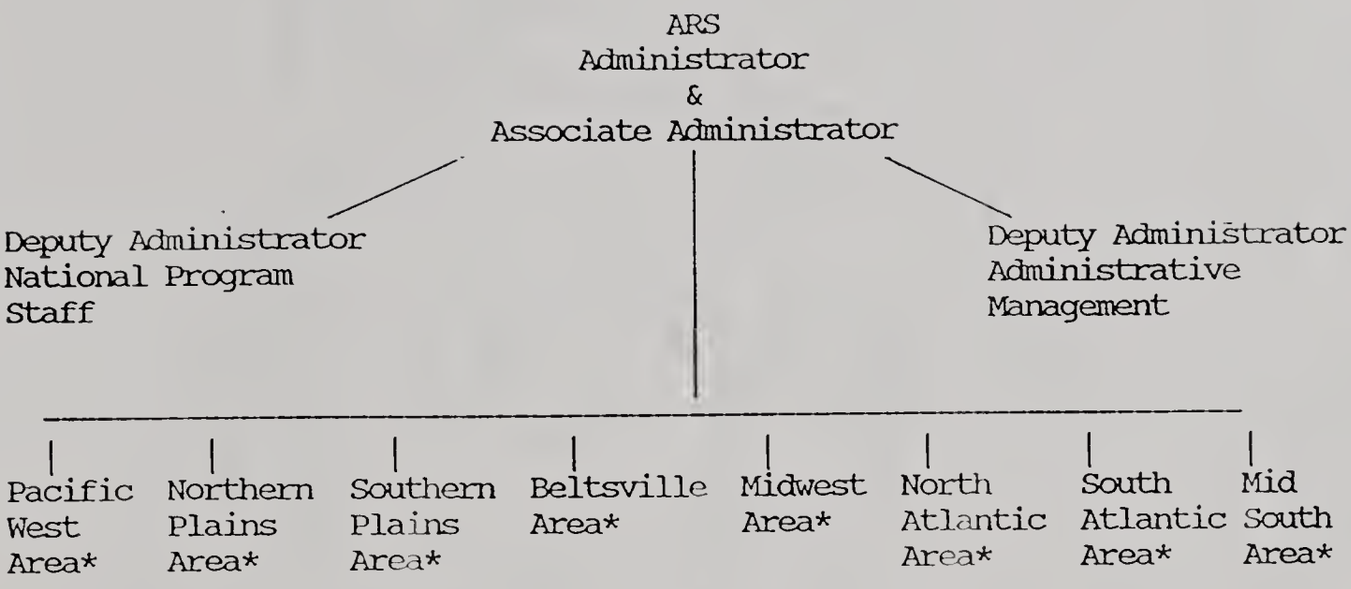
AM: Administrative Management. This branch of ARS manages support activities, such as procurement, facilities, fiscal allocations and personnel operations at all levels in ARS.

NOTE: The organizational scheme described above is presented graphically on the following pages.

U. S. Department of Agriculture
Headquarters Organization

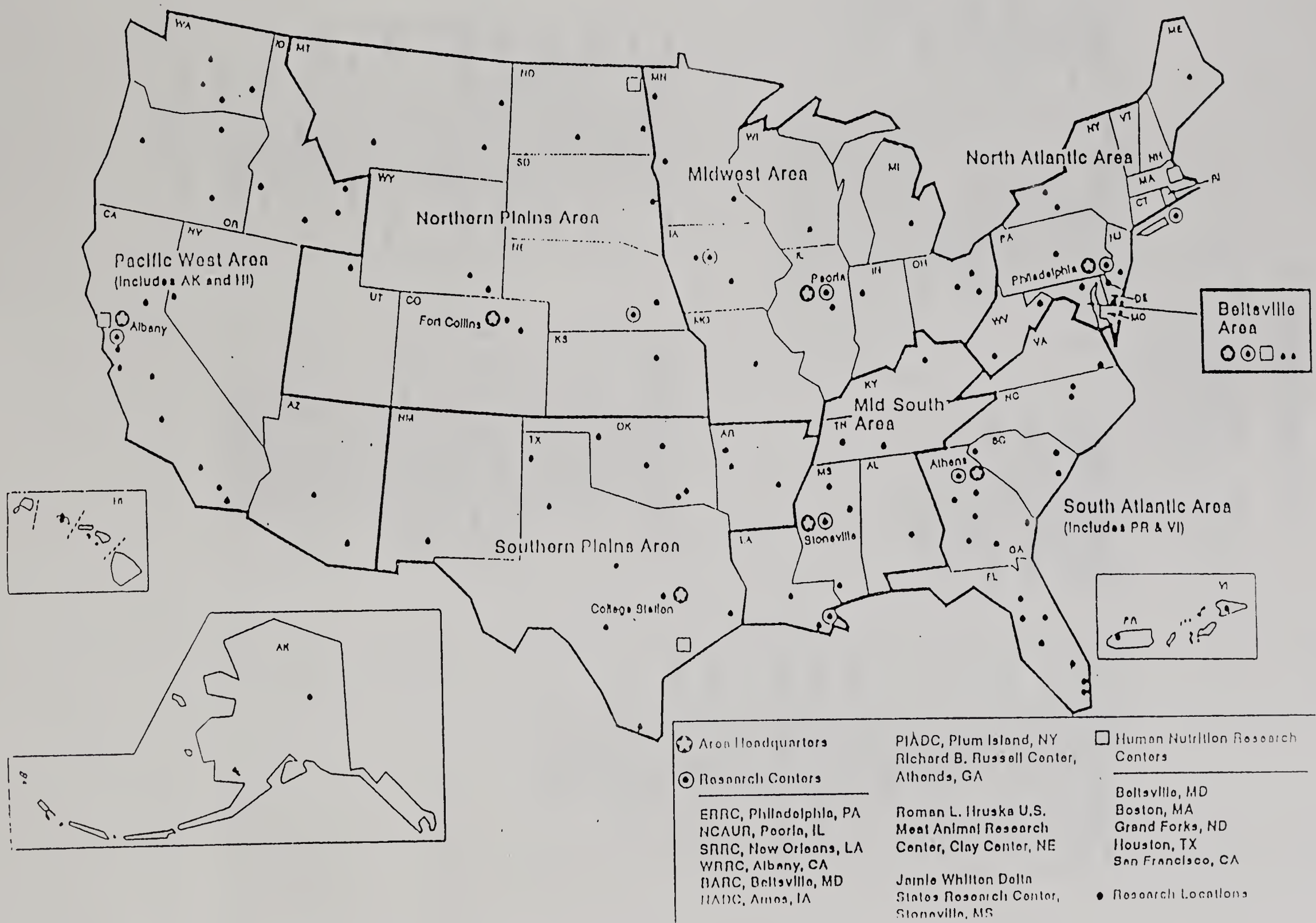


November 1994



[Each Area is led by an Area Director and an Associate Area Director]

Agricultural Research Service - Area Organization



April 1997

USDA, AGRICULTURAL RESEARCH SERVICE
BELTSVILLE AREA

AREA DIRECTOR
K. D. Murrell

ASSOCIATE AREA DIRECTOR
P. E. Johnson

ASSISTANT AREA DIRECTOR
D. F. Cole

U.S. NATIONAL ARBORETUM
- DIRECTOR — T. S. Elias
- ADMINISTRATIVE & FACILITIES MGR. — L. Baldus (acting)
- EDUCATION & VISITOR SERVICES — J. Walker
- FLORAL & NURSERY PLANTS RESEARCH UNIT — R. Jordan
- GARDENS UNIT — E. Ley

NATURAL RESOURCES INSTITUTE
- DIRECTOR — G. R. Evans
- CLIMATE STRESS — S. J. Britz
- ENVIRONMENTAL CHEMISTRY — R. J. Wright
- HYDROLOGY — W. J. Rawls
- INSTRUMENTATION AND SENSING — Y. R. Chen
- PESTICIDE RESEARCH STAFF — G. R. Evans
- REMOTE SENSING & MODELING — V. Reddy
- SOIL MICROBIAL SYSTEMS — P. D. Millner

FACILITIES MANAGEMENT & OPERATIONS DIVISION
- DEPUTY AREA DIRECTOR — J. Van De Vaarst
- ADMINISTRATIVE BRANCH — D. Little
- FARM OPERATIONS BRANCH — H. T. Badger
- FACILITY ENG. BRANCH — F. A. Messineo, W. H. Funkhouser, W. Beverley

PLANT SCIENCES INSTITUTE
- DIRECTOR/ASSOCIATE DIRECTOR — B. Leonhardt/R. Korcak
- BEE RESEARCH — H. Shimanuki
- BIOCONTROL OF PLANT DISEASES — R. D. Lumsden
- FRUIT — R. H. Zimmerman
- HORTICULTURAL CROPS QUALITY — K. Gross
- INSECT BIOCONTROL — E. Dougherty
- INSECT CHEMICAL ECOLOGY — J. Klun
- MOLECULAR PLANT PATHOLOGY — R. E. Davis
- NATIONAL GERMPLASM RESOURCES — A. K. Stoner
- NEMATOLOGY — D. J. Chitwood
- SOYBEAN AND ALFALFA RESEARCH — D. L. Keister
- SYSTEMATIC BOTANY & MYCOLOGY — A. Y. Rossman
- SYSTEMATIC ENTOMOLOGY — M. B. Stoetzel
- VEGETABLE — A. K. Mattoo
- WEED SCIENCE — J. D. Anderson

LIVESTOCK AND POULTRY SCIENCES INSTITUTE
- DIRECTOR — T. J. Sexton
- ANIMAL IMPROVEMENT PROGRAMS — H. D. Norman
- BIOSYSTEMATICS AND NATIONAL PARASITE COLLECTION UNIT — J. R. Lichtenfels
- GENE EVALUATION AND MAPPING — C. E. Rexroad
- GERMPLASM & GAMETE PHYSIOLOGY — L. A. Johnson
- GROWTH BIOLOGY — N. C. Steele
- IMMUNOL. & DISEASE RESISTANCE — J. K. Lunney
- MEAT SCIENCE RESEARCH — M. B. Solomon
- NUTRIENT CONSERVATION AND METABOLISM — B. P. Glenn
- PARASITE BIOLOGY AND EPIDEMIOLOGY — E. R. Gamble
- RESEARCH ANIMAL SERVICES — K. Hummel
- VETERINARY SERVICES — B. Stroud

BELTSVILLE HUMAN NUTRITION RESEARCH CENTER
- DIRECTOR — J. T. Spence
- ASSISTANT DIRECTOR — E. Harris
- ANIMAL FACILITY — T. Greenfield
- CAROTENOIDS RESEARCH UNIT — B. Clevidence
- DIET AND HUMAN PERFORMANCE — J. T. Judd
- FOOD COMPOSITION — N. Miller-Ihli (acting)
- FOOD SURVEYS RESEARCH GROUP — A. Moshfegh
- HUMAN STUDY FACILITY — E. Lashley
- NUTRIENT DATA — J. Holden
- NUTRIENT REQUIREMENTS AND FUNCTIONS — O. E. Levander
- PHYTONUTRIENT — T. Kramer (acting)

1275-39-00 BELTSVILLE AREA
PLANT SCIENCES INSTITUTE
SYSTEMATIC BOTANY AND MYCOLOGY LABORATORY

Research Leader: AMY Y. ROSSMAN Total NTL: 1,378,513 SYs: 7
Narrative:
The mission of the Systematic Botany and Mycology Laboratory is to conduct comprehensive research on the systematics of plants and fungi that promotes their use to solve agricultural problems. The objectives are to produce comprehensive references, informational databases, and scientific monographs for identification of organisms important in agriculture. Computerized information is supplied over Internet to customers such as agricultural scientists and libraries. The unique resources of the U.S. National Fungus Collections and the U.S. National Seed Herbarium establish national standards. The SBML research results in development of effective biological control agents to reduce chemical use in agriculture, improvement of crop plants and genetic resources, and protection of agricultural biodiversity. Beneficiaries are scientists and industries serving farmers, curators of germplasm repositories, plant breeders, seed analysts, and plant quarantine regulatory officials protecting our borders from biological threats and in enhancing global trade.

1. Is the work of your Unit based on customer input and oriented to their expressed needs and priorities?

Yes __X__ No _____

Y Action/regulatory agencies (Federal and State)
Y Farm supply, input, or service sector
Y Food/fiber producer sector
Y Food/fiber/product processing and marketing sector
Y Consumer sector (consumer, environmental, advocacy groups)
Y Community/society sector
Y Scientific community sector

SBML scientists interact daily with customers who require identification of specimens and information about fungi and plants. Technical publications and monographs are prepared in response to user needs. Expert systems and references for identification of agricultural organisms are requested by plant breeders, plant pathologists, and regulatory officials. All SBML products are available over Internet and accessed by about 500 clients per month. Substantial support is provided by direct funding to evaluate names of agricultural plants ($45,000), to develop a database of fungi that threaten American agriculture (APHIS $80,000), and for accurate nomenclature of vascular plants (Natural Resources Conservation Service $5,000). In-kind support is provided by the Chinese National Research Council ($2,000), Japanese government ($2,000), University of Pennsylvania ($1,000), and Austrian Technical Institute ($3,000). Because of its reputation as a unique center of expertise, training is provided by SBML scientists to national and international institutions.

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Research Leader: AMY Y. ROSSMAN Total NTL: 1,378,513 SYs: 7

2. Is the work of your Unit in the national economic interest?

Yes X No _____

The research mission of the SBML is to provide the critical knowledge base about plants and fungi that empowers communication, sustainable use, and development of these organisms. SBML scientists analyze and provide taxonomic and nomenclatural information which directly enhances the preservation of plant germplasm essential to strengthening and diversifying agricultural productivity. Research and information provided by the SBML is consulted by about 500 clients per month through Internet systems. Accurate identification of crop germplasm and plant pathogenic and beneficial fungi results in increased crop productivity and profitable food production. SBML research enhances export-import activities that increase global competitiveness and produces a positive balance of trade in the agriculture sector. A direct outcome of SBML research is the opening of the market for California wheat in China with the first shipment valued at $4.7 million with a future market of $50-$100 million.

3. Is the work of your Unit in the national public interest?

Yes X No _____

SBML provides the biosystematic knowledge base that is the foundation of the National Plant Germplasm System protecting and preserving the biodiversity of crop plants. Research at SBML on mycotoxin-producing and beneficial fungi is essential to safeguarding the health of the American people and providing safe and abundant food. Systematics of beneficial fungi is critical in the development of biological control organisms needed to reduce the use of agri-chemicals, thereby protecting the quality of the environment. New technologies have been developed for defining fungi that cause diseases of deciduous trees and soybeans as well as preventing their introduction into the United States. Products of SBML are used daily by federal officials to protect the national security by preventing biological threats to U.S. borders.

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PLANT SCIENCES INSTITUTE
SYSTEMATIC BOTANY AND MYCOLOGY LABORATORY

Research Leader: AMY Y. ROSSMAN Total NTL: 1,378,513 SYs: 7

4. Is the work of your Unit a national priority?

Yes X No _____

SBML research is critical to addressing all of the ARS National Priorities. SBML provides identifications, accurate scientific names and information through Internet and expert systems. The National Plant Germplasm System depends on SBML systematic knowledge to preserve and utilize the crop genetic resources. SBML scientists conduct critical research on fungi producing toxins in food, poisonous mushrooms, and biological control fungi reducing agrochemical input. Critical export-import decisions affecting international agricultural trade depend on information provided by the SBML. The SBML database of fungi outside the U.S. was instrumental in developing regulations allowing the importation of horticultural plants. SBML expertise on fungi within the United States is crucial to preventing the introduction of potentially harmful exotic fungal diseases and noxious weeds. SBML research had the direct result of opening China to California wheat imports. The first shipment is valued at $4.7 million with future shipments totalling $50-$100 million.

5. Is the work of your Unit a Federal responsibility?

Yes X No _____

SBML research and reference resources developed over the past 150 years are unique. The one-of-a-kind resources at SBML, the U.S. National Fungus Collections,U.S. National Seed Herbarium and associated information ensure time-sensitive responses to questions. The development of these resources requires a long-term commitment and investment. Because the majority of crop germplasm is of foreign origin, taxonomic information for the National Plant Germplasm System demands a comprehensive approach. Fundamental nationally oriented biosystematic research on large groups of agricultural plants cannot be conducted by university or private organizations due to their regional perspectives. SBML has developed the largest on-line, publically accessible database of information about fungi in the world. These databases and tools are needed to provide phytosanitary certificates and determine biological risk that enhances agricultural exchanges. SBML provides a critical mass of expertise which responds to and averts crisis events involving plants and fungi.

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6. Does the work of your Unit contribute to the maintenance and/or enhancement of rural development?

Yes X No _____

The SBML provides comprehensive research and reference resources used by rural farmers for the identification of fungi causing diseases of crops, weeds, and other plants. These resources are available both electronically and in hardcopy. By providing data over Internet SBML reaches rural farmers who need this information. SBML scientists inform small farm industries about new economic opportunities for growing fungi such as shiitake. By reducing the need for pesticides through the development of biological control organisms, profitability of small farms is increased particularly those shifting to sustainable agriculture. Information supplied by SBML enables the correct identification of germplasm. This maximizes its utilization leading to agricultural diversification with benefits for small farms. The information resources on fungi and plants are size-neutral and useful in solving problems occurring in all kinds of agricultural situations.

7. Should the work of your unit be conducted by other research performers at the State level or in the private sector?

Yes _____ No X

No state or private sector organization has the combination of resources required to conduct research on the systematics of agriculturally important plants and fungi available at SBML. The U.S. National Fungus Collections with one-million specimens and database is unique. Comprehensive biosystematic research on cultivated plants and agriculturally important fungi is conducted only at SBML. For example, the cultivated edible mushroom crop is suffering severe losses from a fungus, but individual state plant pathologists only deal with the strains associated with fungi in their state. Solving this problem requires the national approach provided by SBML. Because plant germplasm needed for crop improvement is distributed to regional centers, the nationally standardized set of scientific names provided by SBML is needed for effective communication among germplasm workers. Protecting American agriculture from foreign pathogens and noxious weeds is a federal responsibility requiring the information and expertise provided by SBML.

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PLANT SCIENCES INSTITUTE
SYSTEMATIC BOTANY AND MYCOLOGY LABORATORY

Research Leader: AMY Y. ROSSMAN Total NTL: 1,378,513 SYs: 7

8. Would or will other performers (State and private) assume some or all of this responsibility if the Federal Government were to terminate funding for this research?

Yes _____ No __X__

State agencies and universities do not have these reference and research resources required to carry out the mission of SBML. The U.S. National Fungus Collections and the U.S. National Seed Herbarium are unique resources that serve clientele throughout the nation. The state and university perspective is too provincial to tackle broad-based problems such as those solved by the comprehensive systematic research conducted at SBML. For example, one SBML product is the monumental reference on the 13,000 fungal species on plants throughout the United States available as hard-copy and electronically. The identification and research services address problems of national scope such as providing the knowledge upon which export-import decisions and plant quarantine regulations are based. Movement of crop-threatening pathogens and exotic invaders have no regard geopolitical boundaries. Research on plant germplasm will not be carried out by regional scientists with the comprehensive approach needed to support the requirements of the entire National Plant Germplasm System.

9. If ARS were currently not doing this research, is there a compelling reason for the Federal Government to start it now?

Yes __X__ No _____

A strong customer demand exists for SBML products. One product, the book on fungi in the U.S., is sold out and these data is accessed over Internet by more than 500 times each month. Systematic knowledge provided by SBML develops new sources of fungal germplasm as more effective biological control agents to reduce agrochemical use. Fungi are key to developing low input sustainable agriculture for which SBML provides essential expertise. Research on mycotoxin-producing fungi and expertise on poisonous mushrooms contributes to food safety and human health. The SBML produces information critical to fulfilling the needs of regulatory agencies. Few scientists tackle the difficult systematics of agricultural plants and fungi. SBML products are essential for the National Plant Germplasm System that preserves crop genetic resources and protects agricultural productivity. Fundamental biosystematic research is required to solve urgent and fundamental agricultural problems. The comprehensive systematic research conducted at SBML requires long-term human and fiscal resources.

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SYSTEMATIC BOTANY AND MYCOLOGY LABORATORY

Research Leader: AMY Y. ROSSMAN Total NTL: 1,378,513 SYs: 7

10. What are the consequences if this research is not conducted?

Without SBML research, farmers would not have the resources to identify pest organisms for determining proper managament strategies, and biocontrol agents and new sources of crop germplasm could not be developed. Without the SBML database of exotic fungi, pest risk assessments would be flawed with potential to introduce a foreign fungus or noxious weeds devastating to agricultural and natural ecosystems. New diseases such as dogwood anthracnose could not be identified and described and the means of breeding for resistance would not be possible. Without SBML data and research, exchange of agricultural and horticultural commodities would be slowed or eliminated. Without the computerized specimen data from SBML, California wheat would not be shipped to China and would not realize the substantial economic benefit. Without accurate scientific names provided by SBML, the National Plant Germplasm System could not be able to manage the nation's genetic resources.

11. Is the research success and outcome of your Unit dependent on other research being done within ARS, and/or do other ARS Research Units depend on your Unit's research output?

Yes __X__ No _____

A synergistic relationship exists between SBML and other laboratories at Beltsville and throughout ARS. The National Plant Germplasm System depends directly on SBML for accurate names of plant germplasm to effectively manage their resources. SBML products such as the book on fungi in the U.S. are used daily in both hard-copy and electronic formats throughout the agricultural community. ARS units collaborate with SBML, for example, to develop more effective biological control organisms (Biocontrol of Plant Diseases Lab), to develop natural meadows with lower energy input (Insect Biocontrol Lab), to breed resistant melon lines (U.S. Vegetable Lab), and to study biochemistry of bird's foot trefoil (Forage and Seed Cereal Research). The SBML expertise is a focal point for research on agriculturally important plants and fungi and other ARS locations is dependent on SBML research output to strengthen their own programs. SBML provides the critical knowledge base for research on agriculturally important plants and fungi by both ARS and non-ARS laboratories.